

**Findings Statement**  
*Issued Under the New York State Environmental Quality Review Act,  
Environmental Conservation Law Section 8-0101, et. seq. ("SEQRA")*  
*With Respect to:*

**"Costco Wholesale Store and Fueling Facility"**  
**Town of Yorktown**  
**Westchester County, New York**

**Adopted: December 15, 2014**

**WHEREAS**, this Findings Statement is issued by the Town of Yorktown Planning Board ("Planning Board") pursuant to and as required by the New York State Environmental Quality Review Act ("SEQRA"), Article 8 of the Environmental Conservation Law; and

**WHEREAS**, this Findings Statement draws upon the information the Planning Board received in connection with the proposal to develop a members only Costco Wholesale Store and members only fueling facility and undertake related activities (the "Proposed Action" or the "Project") on a site bounded by US Route 202/ New York State Route 35 (Route 202/35) to the south, Old Crompond Road and residential property to the west, vacant lands of the State of New York to the north, and the Taconic State Parkway ("TSP") to the east (the "Site"); and

**WHEREAS**, the administrative record of the Planning Board, the SEQRA Lead Agency for the Proposed Action, includes the Draft Environmental Impact Statement ("DEIS") accepted by the Lead Agency on September 10, 2012; comments received on the DEIS and the Proposed Action at a duly noticed public hearing held on October 15, 2012 and reconvened and closed on November 19, 2012 and during the period for the receipt of written comments through December 19, 2012; and the Final Environmental Impact Statement ("FEIS") conditionally accepted by the lead agency on October 6, 2014 and for which a Notice of Completion was filed with the Lead Agency on October 21, 2014;<sup>1</sup> and

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<sup>1</sup> The acceptance of the FEIS was conditioned upon the incorporation of specified ministerial revisions to the document, which planning staff confirmed were made.

**WHEREAS**, to assist in its review of the DEIS and FEIS, the Lead Agency retained a series of independent consultants, who worked with the Town of Yorktown Engineer and Planning Staff (collectively, the “Planning Board Professional Staff and Consultants”). The consultants were Cornerstone Associates with regard to natural resources and Jacobs Civil Consultants, Inc. with regard to traffic and parking; and Ryan Law Group LLC as special SEQRA counsel; and

**WHEREAS**, in preparing this Findings Statement, the Planning Board has given due consideration to the DEIS, FEIS and other documents prepared in conjunction with the SEQRA process. These plans, materials and reports submitted by the Applicant; reports and studies of the Planning Board Professional Staff and Consultants; public comments (both oral and written); various correspondence, reports, and comments from involved and interested agencies; all of which are included in the administrative record on which this Findings Statement is predicated; and

**WHEREAS**, the Planning Board considered the technical comments or reports submitted during the comment period by members of the public, some or all of which critiqued aspects of studies conducted by the Project Sponsor for the DEIS or contained countervailing assessments; and

**WHEREAS**, capitalized terms not otherwise defined herein shall have the meanings ascribed to them in the DEIS; and

**WHEREAS**, on June 30, 2010, Retail Store Construction Company (the “Applicant” or “Project Sponsor”) submitted to the Planning Board an application for site plan approval for an approximately 151,092 square foot Costco wholesale store, a fueling facility for Costco customers and 610 on-site parking spaces (the “Application”) on the 18.75-acres Site; and

**WHEREAS**, on August 2, 2010, the Planning Board circulated a Notice of Intent to designate itself as Lead Agency for the Proposed Action pursuant to SEQRA and 6 NYCRR 617.6 of the SEQRA Regulations, as hereinafter defined; and

**WHEREAS**, at a duly noticed meeting on September 13, 2010, the Planning Board, based on its review of the Application, a long-form Environmental Assessment Form submitted by the Applicant and related information, and acting as Lead Agency, issued a Positive Declaration pursuant to Section 617.7 of the SEQRA Regulations; and



**WHEREAS**, at its duly noticed meetings on September 27 and October 18, 2010, the Planning Board considered the draft scope and held a public scoping session on November 8, 2010 to consider public comment, which session was held at Town Hall in Yorktown Heights, New York; and

**WHEREAS**, at a duly noticed meeting on December 13, 2010, the Planning Board, after receiving comment and revising the draft scope, adopted the final DEIS scoping document ("Final Scope") and directed the Applicant to prepare a DEIS; and

**WHEREAS**, the Applicant submitted a preliminary DEIS to the Planning Board for its review on November 16, 2011; and

**WHEREAS**, the Planning Board, at its duly noticed meetings on January 9 and January 23, 2012, reviewed and discussed the preliminary DEIS and identified aspects that were not yet complete; and

**WHEREAS**, after further revisions by the Applicant in response to Planning Board and staff comments, the Applicant submitted to the Planning Department a revised DEIS on August 3, 2012; and

**WHEREAS**, the Planning Board, at its duly noticed meetings on August 13 and September 10, 2012, reviewed and discussed the DEIS with regard to its scope and content; and

**WHEREAS**, on September 10, 2012, the Planning Board accepted the DEIS as complete and adequate in scope and contents and directed that the document be circulated to involved and interested agencies and the public for review and comment in accordance with Section 617.12 of the regulations at Volume 6, Part 617 of the New York Code, Rules and Regulations (the "SEQRA Regulations"), and directed notice of a Public Hearing on the DEIS and Proposed Action to be held on October 15, 2012 in the Town Hall Board Room at 363 Underhill Road, Yorktown Heights, NY; and

**WHEREAS**, on October 15, 2012 the Planning Board held a duly noticed public hearing on the DEIS and the Proposed Action, which public hearing was reconvened and closed on November 19, 2012; and

**WHEREAS**, the Planning Board accepted written comments on the DEIS through December 19, 2012, thereby providing a total of 82 days for public comment on the DEIS; and

**WHEREAS**, from May 2013 through August 2013, the Applicant submitted draft sections of the preliminary FEIS to the Planning Board Professional Staff and Consultants, which reviewed and commented on same; and

**WHEREAS**, from August 2013 through April 2014, the Applicant continued to submit revised draft sections of the preliminary FEIS to the Planning Board Professional Staff and Consultants, which reviewed and commented on same; and

**WHEREAS**, on July 14, 2014, the Applicant submitted to the Planning Board a preliminary FEIS, which had been modified to reflect comments and review of the Planning Board Professional Staff and Consultants; and

**WHEREAS**, on September 8, September 22 and September 30, 2014, the Planning Board held duly noticed public work sessions on the preliminary FEIS; and

**WHEREAS**, on October 6, 2014, after consideration of revisions to the preliminary FEIS at a duly noticed meeting, the Planning Board determined that, subject to specified ministerial changes in the preliminary FEIS, it was adequate and complete in scope and contents; and

**WHEREAS**, on October 21, 2014, a Notice of Completion for the FEIS and the FEIS were filed with the Planning Board, and duly filed and noticed pursuant to the SEQRA Regulations; and

**WHEREAS**, from the date of filing the FEIS on October 21, 2014 to the date of this Findings Statement, a total of 55 days, the Planning Board received and reviewed all written comments submitted by interested and involved agencies and the public, as well as responses to such comments submitted by the Applicant (as set forth in Appendices B and C hereto); and

**WHEREAS**, following the conclusion of the SEQRA process, the Planning Board will commence site plan review, which may result in further enhancements and/or refinements to the Proposed Action.

**NOW, THEREFORE, BE IT RESOLVED** that the Planning Board determines that the requirements of SEQRA have been met, as evidenced by the recitals above; and be it further

**RESOLVED**, that having thoroughly reviewed and considered the FEIS (which incorporates the DEIS) and the entire record of this SEQRA proceeding, thus having considered the relevant environmental impacts, facts and conclusions disclosed in the



FEIS (which incorporates the DEIS), and having weighed and balanced the relevant environmental impacts with “social, economic and other considerations,” the Planning Board, acting as Lead Agency, makes the following findings and determination pursuant to SEQRA and Section 617.11 of the SEQRA Regulations:

**A. Description of the Proposed Action**

The Proposed Action is located at Crompond Road in the Town of Yorktown, Westchester County, New York 10598. The Site is an 18.75-acre parcel situated in the northwest quadrant of the intersection of the TSP and Route 202/35. The Site is presently zoned C-3 (Commercial) which is consistent with the use of the Site for wholesale and retail uses. The proposed fueling facility will require a gasoline filling station special permit from the Town Board, as described in the Required Approvals section below.

The Site has previously been partially developed and consists of two residences, a wholesale nursery, a former gate and fence company (King Gates), which was previously occupied by a gasoline filling station, and a former motel, occupying approximately 10.15 acres. The former gate and fence company and the former motel are currently boarded up and covered in graffiti. There is residual petroleum-related contamination on the Site from the former gasoline station as well as other contamination in portions of the Site from prior uses.

The Project Sponsor will, as part of the Proposed Action, remove the abandoned buildings and other structures on Site, remediate contamination from historic uses, and redevelop the Site as a 151,092 square foot Costco wholesale store and members only fueling facility. The store will be located in the eastern portion of the Site, with the entrance vestibule located in the southwestern corner of the building. Included in the Costco building footprint will be a tire service center where tires are sold and mounted for Costco customers. The tire service center will provide no other auto mechanical services.

The Proposed Action includes 610 on-site parking spaces located south and west of the store. It also includes a 12-dispenser fueling facility for Costco customers, located south of the building’s southeastern corner. The fueling facility will be constructed in compliance with all state, federal, county and local environmental and safety requirements, as described in greater detail in the “Hazardous Materials” section below.

The Proposed Action requires disturbance of approximately 14.35 acres of the Site, of which approximately 10.15 acres were previously disturbed by historic uses. The Project does not require any direct disturbance of two wetlands areas located on the Site (Wetland A to the west, and Wetland B to the northeast), and disturbance of Wetland buffer areas has been minimized through changes in the Site Plan in the FEIS (the "FEIS Site Plan") from the Site Plan contained in the DEIS (the "DEIS Site Plan"). The Proposed Action also includes a stormwater management system that will capture and treat stormwater in below-ground hydrodynamic structures and infiltration chambers, reducing the volume and addressing the quality of stormwater discharges to wetlands and downstream water bodies.

Costco provides a broad range of consumer goods to both individual customers and local retailers, often in bulk and at discount prices. A detailed Retail Market Analysis, including a Commercial Character Analysis, was performed by the Project Sponsor's consultant, Ferrandino & Associates Inc., to confirm that the surrounding retail market can accommodate the proposed Costco. This analysis indicates that there will be sufficient support in the market areas for the proposed Costco. Redevelopment of the Site will generate additional property tax revenues from the Site to the Town of Yorktown, the Yorktown Central School District, and Westchester County, as well as additional sales tax revenues to the State of New York, Westchester County and the Metropolitan Commuter Transportation Mobility Tax.

In conjunction with the Proposed Action, the Project Sponsor has proposed the extension of two utility services to the Site: sanitary sewer and natural gas. Both services currently terminate underneath and in the vicinity of the intersection of Old Crompond Road and Stony Street. The Applicant proposes to extend the sewer service along Old Crompond Road to the Project Site, as well as across Route 202/35, approximately 1,900 feet from a manhole recently constructed to serve the "Crompond Crossing" project, and located approximately 200 feet east of the aforementioned intersection. Natural gas service will be extended approximately 2,000 feet along Old Crompond Road from Stony Street to the Site. The extension of the sanitary sewer will require inclusion within the Hunter Brook and Peekskill Sewer Districts. Inclusion within the Hunter Brook Sewer District will require approval by the Town Board of the Town of Yorktown and inclusion



in the Peekskill Sewer District will require approval by the Westchester County Board of Legislators.

In addition to extension of utility infrastructure, the Proposed Action includes Applicant sponsored improvements to Route 202/35 between Strang Boulevard to the east and Old Crompond Road, located immediately west of the Project. Improvements will include the addition of a westbound through lane, sidewalks on the north side of the road, improvements to the traffic signals, addition of new turning lanes, and a paved shoulder that will accommodate a bike lane. With these proposed improvements, the Proposed Action is expected to improve peak hour traffic operating conditions in the vicinity of the Site as compared to existing and No-Build Conditions. Improvements on Route 202/35 will require the approval of the New York State Department of Transportation ("NYSDOT").

Project construction is expected to take approximately 15 months, and the store is expected to be completed in 2016.

The 151,092 square foot Costco wholesale building will be placed parallel to the eastern property line. The building's main axis will run north and south, having the store entrance vestibule located at its southwest corner. Emergency exits will be located along the rear of the store, which will face east toward the Taconic State Parkway ("TSP"). Loading and trash receptacles will be located along the northerly side of the building which will yield minimal visual exposure to the public and local residents. The fueling facility will be situated in the southeast quadrant of the Site having access from the interior access drive.

The Project will provide two points of access from Route 202/35. The main access will be located opposite Mohansic Avenue. This intersection will be signalized and will allow full turning movements. A secondary non-signalized access, limited to right turns in and out, will be located approximately 300 feet further west of the Project's main entrance and will provide access to and from the Route 202/35 westbound lane. The on-site parking of 610 parking spaces will include 12 ADA accessible spaces and parking for 10 bicycles. Pedestrian access from Route 202/35 will be by a sidewalk along the main site access drive to the building entrance.

An inner circulation road will provide connectivity from the main entrance, along the building frontage to the far side of the building while providing access to individual

parking aisles. The parking aisles in the southerly parking area will be arranged in a manner to direct patrons toward the building's main entrance. The majority of the westerly parking area will provide patrons with convenient access to the building's entrance.

Truck access into the Site will be at the main entrance. Circulation to and from the building loading area, which will be located at the north end of the site and have the capacity to serve five trucks, will be provided by a dedicated access road along the east side of the Costco building. Fire and emergency vehicle access will be provided along all four sides of the Costco building.

A retaining wall will be constructed along the western side of the parking area to limit the extent of grading and consequently minimize disturbance to the Wetland A buffer area. Stormwater treatment and abatement will be provided in a subsurface infiltration system placed beneath the westerly parking area and a surface detention basin at the north end of the Site.

Landscape buffers will be provided along the perimeter of the parking area. Earth embankments, which will be created along the perimeter of the parking area and entrance drive, will be landscaped with a combination of groundcover shrubs and trees. A landscape strip will be provided along the site frontage on Route 202/35 and Old Crompond Road. A landscape screen of evergreen trees will be planted within the DOT right-of-way to help screen the view from the TSP. A natural wooded buffer ranging from approximately 100 to 400 feet wide will remain along the westerly property line.

The Site Plan will be subject to further review during the site plan review process, where very specific design and planting details will be submitted to and reviewed by the Planning Board. More details on certain aspects of the Proposed Action are contained in Section D and Appendix A of this Finding Statement.

## **B. Revisions to Proposed Action**

In response to comments received on the DEIS from the public, involved and interested agencies and the Planning Board Professional Staff and Consultants, to reduce the Proposed Action's potential environmental impacts and to improve project design, the Project Sponsor formulated a series of minor modifications to the Proposed Action, which are set forth in the FEIS, and summarized below:



- Extension of the second exit lane for the entire length of the primary Site access driveway, in order to reduce queuing and improve Site egress movements;
- Narrowing of the fueling facility exit area and addition of a second receiving westbound lane opposite the fueling facility, in order to channelize existing traffic and improve circulation;
- Addition of a striped safety zone leading to and from the secondary site access and restriction of left turn movements at the secondary site access driveway, in order to promote traffic safety and improve circulation;
- Shifting of portions of the westerly parking lot curb and main parking lot bays to the east, narrowing of the landscaped island to the west of the main entrance drive, and modification of interior parking, in order to reduce impacts on wetland buffer areas and improve traffic circulation and safety;
- Addition of retaining walls along the westerly curb line, in order to reduce impacts on Wetland A buffer area;
- Extension of the pedestrian sidewalk from Route 202/35 to the building entrance and addition of bicycle parking racks, in order to promote bicycle and pedestrian access;
- Enlargement of the proposed stormwater infiltration system, in order to improve on-site and offsite stormwater treatment;
- Addition of separate water quality treatment for stormwater runoff from the proposed fueling facility, in order to improve on-site stormwater treatment;
- Addition of new stormwater treatment practices addressing runoff from the road improvements to be undertaken by the Applicant, in order to improve off-site stormwater treatment;
- Revision of proposed sanitary sewer extension, in order to coordinate with the Crompond Crossings development and reduce impacts to roadway pavement;
- Widening of Route 202/35 and addition of a new westbound turning lane on Route 202/35, in order to improve circulation onto the TSP access ramps and reduce delays;
- Relocation of an existing water transmission main in order to accommodate the proposed widening of Route 202/35; and

- Addition of a new bus stop along the Route 202/35 at the Site frontage, in order to promote the use of public transportation to access the Site.

The foregoing modifications were included in the FEIS. In response to comments on the FEIS, to further reduce the Proposed Action's potential environmental impacts and to further improve project design, the Project Sponsor formulated additional enhancements as summarized below:

- Installation of Jellyfish<sup>®</sup> Filter units, which will be used in series with the Vortech<sup>®</sup> units to pre-treat stormwater before it is discharged to the subsurface infiltration system already included in the FEIS.
- Installation of a 28,000 cubic foot stormwater storage chamber connected with the detention basin (as shown in Figure 1 of Appendix C of the letter from TRC Engineers, Inc. dated December 5, 2014, attached to this Finding Statement as Appendix C and hereinafter the letter together with its appendices A, B, C & D and Figure 1 shall be referred to as "The TRC Letter & Appendices, December 5, 2014") to attenuate the post-development runoff rates to pre-development levels from the 50- and 100-year storm using the new Northeast Regional Climate Center ("NRCC") rainfall values.

The Site Plan will be further revised to reflect these changes as further described herein.

All such revisions enhance the effectiveness of the stormwater management system without giving rise to any significant new or increased significant adverse environmental impacts not addressed in the DEIS; rather, the modifications improve the Proposed Action and reduce environmental impacts. In addition, there have been no changes in circumstances or newly discovered information that give rise to new or increased significant adverse impacts not addressed in the DEIS. In particular, the Planning Board finds that the information provided in The TRC Letter & Appendices, December 5, 2014, and the proposed revisions to mitigation of the Project resulting therefrom, do not trigger or disclose new or significant adverse impacts that had not already been analyzed in the Draft and Final Environmental Impact Statements. Accordingly, the Planning Board finds and determines that a supplemental EIS is neither necessary nor warranted.



### **C. Required Permits and Approvals**

The agencies identified below have review, direct approval, or permit issuing authority over the proposed action:

#### Town of Yorktown Planning Board (Lead Agency)

- Site Plan Approval
- Parking Determination
- Wetlands, Stormwater and Tree Removal Permits
- Signage

#### Town of Yorktown Town Board

- Approval of Expansion/Extension of Hunter Brook Sewer District
- Special Use Permit for Fueling Facility
- Authorization/Coverage under the SPDES General Permit for Stormwater Discharges from Construction Activity, as an MS-4 municipality

#### Westchester County Department of Health ("Westchester County DOH")

- Public Sewer Extension
- Public Water Main Extension
- Petroleum Bulk Storage Permit
- Petroleum Spill Remediation (anticipated per delegation from the New York State Department of Environmental Conservation ("NYSDEC"))
- Backflow Prevention Device Permit

#### Westchester County Board of Legislators

- Approval of Expansion/Extension of Peekskill Sanitary Sewer District

#### New York City Department of Environmental Protection ("NYCDEP")

- Stormwater Pollution Prevention Plan ("SWPPP") approval

- Public Sewer Extension

#### New York State Department of Transportation

- Roadway/Signal/Pedestrian Improvements to Route 202/35
  - Signage
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- Utilities within NYSDOT Right-of-Way
  - Landscaping/Screening in the TSP right-of-way.

#### Other Approvals

- Local Utility Connections (electric, gas, telephone, cable TV)

The Planning Board finds and determines that if, despite reasonable efforts, the Project Sponsor is unable to obtain the approval from the Town of Yorktown Town Board and/or County of Westchester Board of Legislators for the extension of the aforementioned Sewer Districts, the Proposed Action may nonetheless proceed if the Project Sponsor obtains the necessary approvals for the use of an on-site wastewater disposal system, which has been discussed in the FEIS. The Planning Board notes that, depending on the circumstances, an on-site wastewater disposal system may necessitate a requirement to amend the Site Plan.

### **D. Potential Impacts and Mitigation**

#### **1. Land Use, Planning and Zoning**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on land use, planning and zoning.*

The Site is zoned C-3 (Commercial) and located within the Bear Mountain Triangle, which is identified in Town's Comprehensive Plan as "Yorktown's major opportunity site for economic development." The eastern and western land areas within the Bear Mountain Triangle are separated physically by a significant grade difference, which have lent themselves to be known more informally as the "top of the hill," and the "bottom of the hill," respectively. At the eastern end, which includes the Site, the



Comprehensive Plan seeks to promote retail and office uses “with a regional draw,” such as the Project. At the western end, the “bottom of the hill,” the Comprehensive Plan envisions a “village center” with smaller stores and limited mixed use.

Under the Comprehensive Plan, the design and development concepts for a C-3 zone include:

- Freestanding businesses
- Small minimum lot size
- Significant open space requirement (e.g., not less than 30 percent<sup>2</sup> of total land area)
- Woodland buffers adjacent to single-family residential zones, and minimum 20-foot landscaping strips along street frontages
- Cross-access agreements and consolidated entrances, wherever possible
- Sidewalks along the street frontage, and walkways connecting store entrances on adjacent lots
- Lighting standards should require outdoor light to be focused downward and away from residential areas. Standards should also strive to reduce glare effects
- All areas should be subject to natural resource protection requirements relating to wetlands, water bodies, steep slopes, tree clearing, etc.

Development of a Costco wholesale store is consistent with foregoing design concepts, and is permitted as-of-right within the Site’s C-3 zone. In particular, the “small minimum lot size” design concept does not restrict the maximum size of a C-3 establishment; instead, it is intended to maintain the flexibility to accommodate both smaller-scale development at the bottom of the hill and larger retail uses with a regional draw on the Site. In developing the Comprehensive Plan, the Town Board considered proposals to amend the Site’s zoning to restrict larger retail development. Although the Town Board subsequently adopted legislation rezoning other parcels on Route 202/35 west of Pine Grove Court and on Route 6 in Mohegan Lake, it decided to retain the C-3 zoning within the BMP Triangle because “leaving the existing C-3 zoning in this area

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<sup>2</sup> The Comprehensive Plan recommended that at least 30% of total land area be preserved as open space, and the project meets or exceeds this recommendation. The Planning Board notes that the zoning regulations for C-3 do not specify the amount of required open space.

leaves more flexibility for a retail draw in the [Bear Mountain] Triangle, and thus better supports Policy 4-24 of the 2010 Comprehensive Plan.”<sup>3</sup>

The Proposed Action will therefore accomplish the Comprehensive Plan’s goal of establishing a “regional draw” within the Bear Mountain Triangle, and will further the public policy by redeveloping an underutilized Site. The Planning Board notes that certain aspects of the Proposed Action will require approvals from other state and local agencies, including a special use permit from the Yorktown Town Board for the fueling facility. While the FEIS discusses the impacts of those separate applications, the reviewing agencies will issue their own SEQRA Findings prior to their respective determinations.

In addition to its consistency with the Town of Yorktown Comprehensive Plan, the Proposed Action is consistent with the Town’s Sustainable Development Study which recommends shifting potential development to central locations, like the Bear Mountain Triangle and Route 202/35 corridor, while reducing the density on larger parcels located outside of these target areas. The Proposed Action is also consistent with both the Westchester County Patterns for Westchester: The Land and the People (1996) and Westchester 2025 (2010), both of which recommend conserving the environmental resources and nurturing the economy by strengthening existing centers and corridors of development.

The Proposed Action is in close proximity to the FDR State Park, which has been designated by the County of Westchester as a Critical Environmental Area. The potential impacts on the Park, to the extent they will occur, such as visual, traffic, air quality and noise, will also be insignificant, as discussed in Section D. 2, 11, 13 and 14 herein.

## **2. Visual Character**

*The Planning Board finds that the Proposed Action’s impacts to visual character will be mitigated to the greatest extent practicable with landscaping, vegetative screening and Dark Sky technology for outdoor lighting.*

A Visual Impact Assessment for the Proposed Action was conducted in accordance with NYSDEC guidance in order to (a) characterize the visual setting of the

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<sup>3</sup> The SEQRA Findings Statement for the Comprehensive Plan adopted by the Town Board on June 15, 2010, cites to Policy 4-23 in error.



Site and the surrounding area, (b) assess the visual change and aesthetic impacts associated with the Project, and (c) inform landscaping decisions to best preserve aesthetic resources and avoid adverse impacts. The Visual Impact Assessment included a balloon study and computer-simulated representations of the visual impacts of the Proposed Action in three dimensions from multiple vantage points, including those from the TSP southbound off-ramp, the TSP mainline, and the western, southwestern and southern boundaries of the Site. The Applicant has also consulted with the New York State Office of Parks, Recreation and Historic Preservation (“NYSOPRHP”) and NYSDOT with regard to signage and potential visual impacts on the TSP and the FDR State Park (see Section D.1 above).

The Site is visible from the TSP (a state-designated Scenic Byway), Route 202/35, and a number of local roads. As noted above, the Site is in close proximity to the FDR State Park, which has been designated by the County of Westchester as a Critical Environmental Area. Views of the Site are currently impacted by the abandoned motel and rundown condition of the former King Gates, including boarded-up windows and doors and graffiti-sprawled walls. The Applicant conducted balloon studies to assess, among other potential impacts the potential visual effect on the FDR Park. The Project will not be visible from the Park during full leaf conditions, but might be visible by users (e.g., hikers) from a high knoll within the Park (approximately one mile from the Site) during winter leafless conditions. This will not significantly affect the Park or its uses.

The Proposed Action will be constructed below the elevation of the TSP, and will not be visible from the TSP northbound lanes or residential areas due east of the TSP. Views of the Proposed Action from the TSP southbound lanes and exit ramp will be screened by proposed landscaping, including deciduous trees and evergreen trees that are expected to reach 20 feet in height in approximately five years, and upon maturity will reach 40-50 feet in height. Views from the northwest area of FDR State Park (southeast of the Project) will remain only in leaf off conditions and are found to be insignificant and not to affect the park as a critical environmental area. On the easternmost portion of the Site, nearest to the TSP, approximately 100 evergreen trees will be planted to provide at least partial screening of the Project from the TSP. Currently the former hotel structures are visible from some points on the TSP.

Existing woodlands as well as proposed landscaping will limit visibility of the Project from residential neighbors along Old Crompond Road, which is now partially shielded from the Site. No signs will be placed on the north or east sides of the building or canopy that face the TSP. If approved, the signage on the canopy would be visible from the southwest. Signage for the remaining sides of the building and canopy will need to be approved by the NYSDOT because, even though the signs are not facing the parkway, they are located within 500 feet of the TSP.

Outdoor light fixtures on the Site will be selected with so-called Dark Sky technology to minimize off-site impacts, including shielded luminaires along the Site perimeter and luminaire design that directs light downward to reduce glare. The lighting will meet the minimum standards for traffic and pedestrian safety recommended by the Illuminating Engineers Society during operational hours (typically until 8:30 p.m. on weekdays and 6 p.m. on weekends). After such hours, minimal lighting, typically 25 percent of the luminaires, will remain on for security. The lighting for the building and parking areas will also be consistent with the recommendations of the Fatal Lights Awareness Program, designed to protect birds from being attracted to artificial sky glow.

The lighting will be required to meet the standards in Chapter 200-6 of the Town of Yorktown Code. The Applicant may request a waiver from the Town to install one hundred fifty-five (155) 25-foot light poles, as compared with approximately two hundred thirty (230) 16-foot light poles permitted as of right.

The Project is consistent with the visual character of the surrounding corridor, including retail development located along Route 202/35. With appropriate landscaping, screening and restrictions relating to lighting, as described herein, the Planning Board finds that the Project's impacts to visual character will be mitigated to the greatest extent practicable.

#### ***Mitigation and Improvements for Visual Impacts***

- a. Landscaping proposed in islands within the parking area to be maintained to prevent sight distance interference including pruning of low tree limbs and trimming of shrubs to prevent potential visual impairment
- b. A landscape screen of evergreen trees will be planted within the DOT right-of-way to help screen the view from the TSP; this is to be maintained by Applicant



- c. A natural wooded buffer ranging from approximately 100 to 400 feet wide will remain along the westerly property line
- d. Specific landscaping plan, including maintenance (*See also Section D.5 herein, Flora & Fauna*)
- e. Specific site lighting plans including the following:
  - i. Light fixtures along the perimeter of the site will be equipped with shielded luminaires to minimize light spillage
  - ii. "Dark sky" luminaire optics that throw light downward in order to minimize sky glow and nighttime glare
  - iii. Lighting will meet the minimum standards for traffic and pedestrian safety, the Town of Yorktown Lighting Ordinance and those recommended by the Illuminating Engineers Society during operational hours (typically until 8:30 p.m. on weekdays and 6 p.m. on weekends)
  - iv. After hours, lighting for security purposes will be reduced to 25% of lighting during operational hours
  - v. Lighting for the building and parking areas will be consistent with the recommendations of the Fatal Lights Awareness Program, designed to protect birds from being attracted to artificial sky glow

### **3. Soils and Topography**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on soils and topography.*

#### ***Soils***

Grading of soils will be required for the construction of the Proposed Action. The most common soil types within the proposed area of disturbance are Udorthents, Smoothed, and Urban Land, which have been largely altered by prior cutting, filling and development. Charlton and Sutton soils dominate the remainder of the uplands within areas of disturbance, which are suitable for development. Most of the unaltered soil types on Site, including wetland soils and Chatfield, Hollis and other loams, are located on the western side of the Site outside of the proposed area of disturbance.

Impacts to soils associated with the Proposed Action are temporary and relate primarily to the potential for soil erosion and sedimentation. To reduce such impacts, a

Sediment and Erosion Control Plan has been prepared in compliance with New York Standards and Specifications for Erosion and Sediment Control, and a preliminary Stormwater Pollution Prevention Plan “(SWPPP)” has been prepared in compliance with the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity. The Sediment and Erosion Control Plan and SWPPP will comply with applicable NYSDEC, NYCDEP, and Town of Yorktown regulations. The plans specify erosion and sediment control practices that are common for a project of this type, including, but not limited to, a stabilized construction entrance and reinforcement mat, hydromulch, hydroseeding, dust control, silt fencing, soil stockpiling, water bars, sediment traps, and inlet protection. During construction, a maximum of five (5) acres will be disturbed at any one time prior to stabilization, and disturbed areas will be stabilized, either temporarily or permanently depending on the status of construction, prior to disturbing additional acreage. Finally, in accordance with the SWPPP, erosion control measures will be implemented and inspected for effectiveness throughout the construction process. Following construction, soil erosion from the Site will be minimal since developed areas will be stabilized and stormwater management features will be fully functional.

### *Slopes*

The majority of construction activities for the Proposed Action will occur in areas with slopes of less than 25 percent. Exposing soils on steep slopes (greater than 25%) during construction increases the potential for erosion in the short term. Therefore, in the FEIS Site Plan, the Applicant has reduced the disturbance to steep slopes to 0.12 acre by constructing retaining walls and eliminating previously proposed embankments in the DEIS (which impacted 0.52 acre of slopes greater than 25% surrounding the Wetland A buffer). The proposed 0.12 acre disturbance is substantially less than the maximum one (1) acre disturbance threshold stipulated in the SPDES General Permit for Stormwater Discharges from Construction Activity. Finally, adherence to an approved Soil Erosion and Sediment Control Plan will control any impacts associated with the disturbance of steep slopes.



## ***Geology***

The bedrock underlying the Site is Precambrian, metamorphic gneiss. Although some bedrock outcrops occur, the majority of the Site has a surficial layer of glacial till, with depth to bedrock varying between four and twenty-four feet. Cut and fill operations will result in approximately 113,000 cubic yards of material excavation, which includes approximately 22,000 cubic yards of rock excavation. Where rock is encountered, the preferred method of removal will be mechanical (rippers, hammers, and hydraulic rock splitters), and only where such measures cannot be performed effectively will jackhammers or blasting be used. Any blasting will be performed in compliance with all applicable Federal, State, County and Town of Yorktown regulations. A blast monitoring program will be implemented to limit peak particle velocity and noise impacts, and blasting mats will be used to protect adjacent structures and onsite personnel from fly-rock. Finally, to the extent it is needed, blasting will be limited to days and times permitted by the Town of Yorktown Town Code and the building inspector.

## ***Mitigation and Improvements for Impacts Related to Soils***

- a. Construction of retaining wall on the westerly side of the parking area to minimize limit of soil and steep slope disturbance
- b. Submission of construction-phasing plan to limit the amount of disturbance at any one time
- c. Installation and maintenance of temporary and permanent erosion control measures
- d. Earthwork operations will be performed under the supervision of a Geotechnical Engineer
- e. Where rock is encountered, the preferred method of removal will be mechanical (rippers, hammers, and hydraulic rock splitters), and only where such measures cannot be performed effectively will jackhammers or blasting be used
- f. A blast monitoring program will be implemented to limit peak particle velocity and noise impacts, and blasting mats will be used to protect adjacent structures and onsite personnel from fly-rock
- g. See also mitigation and improvements listed in Section D.15 herein (*Building Demolition and Construction*)

#### 4. Hazardous Materials

*The Planning Board finds that the Proposed Action will not have a significant adverse impact with respect to existing hazardous materials on the Site and further finds that the fueling facility as designed will give rise to no significant adverse impacts to soil, ground water and surface waters.*

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##### **Prior Contamination:**

The potential presence of contamination on Site was initially investigated by the Project Sponsor in an April 21, 2008 Phase I Environmental Site Assessment prepared by EcolSciences, Inc. and a September 2009 Phase I Environmental Site Assessment prepared by Soil Mechanics Environmental Services ("SMES"). These investigations identified a number of preexisting Recognized Environmental Conditions ("RECs"), which were investigated in Phase II Investigations by EcolSciences dated January 25 and April 1, 2010. These investigations entailed the sampling of soil and groundwater. The Phase II investigations detected volatile organic compounds ("VOCs"), metals, and/or polychlorinated biphenyls ("PCBs") exceeding NYSDEC Commercial Use Soil Cleanup Objectives<sup>4</sup> at certain locations on the Site, including the lawn mower shop, below the motel basement floor, and at a drainage pit in the basement stairwell of the motel. In addition, there are semi-volatile organic compounds ("SVOCs") in the soil at certain locations of the Site, and benzene (a VOC) in groundwater, due to an historic petroleum spill associated with the gasoline station formerly on the Site. All required remediation will be in compliance with all applicable regulatory requirements and approvals.

During construction of the Proposed Action, contaminated soil will be excavated and disposed of at an approved location in compliance with all local, state, and federal regulatory requirements. This remediation will result in the closure of a petroleum spill case associated with prior uses of the Site, which was reported to NYSDEC on March 28, 2012 (likely by the Westchester County DOH). In addition, the Proposed Action will empty, clean and remove three underground storage tanks and five aboveground storage tanks onsite in accordance with state, county and local regulations. Septic systems on the Site will be closed in accordance with Westchester County Department of Health

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<sup>4</sup> NYSDEC has adopted soil cleanup objectives for remedial programs under its jurisdiction, which apply different objectives to different types of uses.



regulations, and hydraulic lifts and drums on the Site will be removed during construction. The remediation associated with the Proposed Action will reduce existing contamination and environmental hazards associated with prior uses of the Site, a beneficial impact. During construction, the generation of fugitive dust and particulate matter will be managed as discussed in an Environmental Health and Safety Plan/ Community Air Monitoring Program (“EHASP/CAMP”), prepared in accordance with NYSDEC guidelines.

### **Fueling Facility**

The Proposed Action includes a modern gasoline fueling facility, equipped with three 30,000-gallon fiberglass double-walled tanks that are warranted against leaks due to internal or external corrosion for 30 years. All tanks will feature a hydrostatic monitoring system that continuously monitors for leaks as small as 0.1 gallons per hour, exceeding the tank testing requirements of the U.S. Environmental Protection Agency (“EPA”). All below-grade supply and vent piping will also feature secondary containment, and piping integrity will be monitored continuously during fuel dispensing using an in-line electronic leak detection system. If a drop in pressure is identified, the dispenser flow will be automatically restricted. In addition, the system will feature liquid level sump sensors with secondary containment, providing redundant piping leak detection. Dispenser, submerged turbine, and product piping leaks will be secondarily contained and monitored by liquid level sensors in the dispenser and submerged turbine sumps. If liquid is detected, a visible and audible alarm will identify the leak location and the fueling system will be shut down.

The foregoing precautions, which meet or exceed existing and proposed EPA regulations, reduce the potential for a release from the proposed storage tanks or piping and any impacts therefrom. Any leaks or spills are expected to be detected early and captured by secondary containment system before they reach the environment. Furthermore, in the event that fuel is spilled within the fuel dispensing area, the spill will be cleaned immediately by onsite personnel using spill containment and remediation kits located adjacent to the controller enclosure for the gasoline facility. A detailed operations and maintenance program, including spill prevention and response measures will conform to all County and NYSDEC regulations.

***Mitigation and Improvements for Impacts Related to Hazardous Materials***

- a. Removal of contaminated soil
  - b. Closure of petroleum spill
  - c. Closure of septic systems on site
- 
- d. Removal of hydraulic lifts and drums
  - e. Empty, clean and remove three underground storage tanks and five aboveground storage tanks onsite
  - f. Submission of an Operations and Maintenance Plan for the fueling facility including Stage II vapor containment and recovery devices
  - g. Submission of a de-icing plan that provides for appropriate indoor storage of ice control agents on the Site and that application of NYSDEP approved compounds be performed by an outside contractor
  - h. Submission of an Environmental Health and Safety Plan/ Community Air Monitoring Program to manage fugitive dust and particulate matter

***Mitigation and Improvements for Impacts Related to Construction Gas Station Special Permit***

- a. The fueling facility will be required to include the following safety features:
  - i. Emergency telephone that will automatically dial 911 when the handset is lifted from the hook
  - ii. Eight canopy-mounted video cameras with a viewing monitor located in the warehouse
  - iii. Two emergency shut off switches located adjacent to the fueling area and the equipment enclosure to shut off all electrical power to the dispensers and turbines
  - iv. High-level alarms located in the equipment enclosure and the Costco Warehouse that sound when the tank reaches 90% capacity or in the event of a UST or piping leak
  - v. An overfill prevention valve that shuts the tank at 95% capacity
  - vi. A system monitoring console (Veeder Root) located inside the Equipment Enclosure



- vii. Automatic fire suppression systems (snuffers) installed in each dispenser and turbine sump
- viii. A separate stormwater treatment facility to capture and treat runoff from the fuel filling and dispensing areas is included in the stormwater management design
- ix. The fueling facility will be inspected daily consisting of a complete walk through of the gasoline station area to visually check the condition of the nozzles, hoses, dispenser damage or leakage, stained or discolored pavement, spill buckets, and fill and vapor return tubes. Any potential issues will be addressed prior to use of the equipment and a daily facility inspection report will be prepared by the operator, filed onsite, and maintained for three years
- x. All of the safety equipment installed at the facility will be of the latest technology available (i.e. hose breakaways to minimize spillage in the event of premature vehicle departure) and meet or exceed all Federal and State regulations and codes
- xi. All employees assigned to the fueling facility will receive instruction on the safety procedures at the facility
- xii. A spill cleanup kit and emergency response plan will be located within the Equipment Controller enclosure
- xiii. Absorbent materials will be staged at strategic locations throughout the facility for use in immediately containing and addressing minor spills. All used absorbent materials will be placed in a NYSDOT-approved container for proper offsite disposal by a licensed hauler
- xiv. The tanks will be continuously monitored during filling and an audible high-level alarm will sound when the tank reaches 90% capacity
- xv. Each tank will be equipped with a ball float vent valve and extractor fitting to restrict delivery flow at 95% of the tank capacity
- xvi. The paved surface upon which the gasoline dispensers are placed will be concrete

- xvii. Costco personnel will be trained to respond immediately to all minor surface spills using spill containment and cleanup kits that are located throughout the facility
- xviii. Any potential spill at the gas dispensers of gasoline or oil will be cleaned up immediately by gasoline station attendants using the spill kits
- xix. All tanks will feature a hydrostatic monitoring system that continuously monitors the inner and outer tanks
- xx. This system shall meet or exceed the United States Environmental Protection Agency's (USEPA's) most recent and stringent requirements as a precision tank test ("tank tightness test") and is able to detect leaks as small as 0.1 gallons per hour
- xxi. Diesel fuel will not be sold at the Site
- xxii. Fuel will be sold only to Costco members
- xxiii. Trained personnel at the fueling facility in accordance with state and federal regulations

## **5. Flora and Fauna**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on flora and fauna.*

The flora and fauna on Site were investigated by Evans Associates Environmental Consulting, the Applicant's consultant, through 14 field investigations conducted over a period spanning nearly three years, as well as a review of resource maps and other publications documenting which habitats may be present on Site and which plant and animal species could potentially use these habitats. These investigations and surveys were conducted pursuant to the Town of Yorktown's guidelines for Wildlife and Plant Biodiversity Assessments and were consistent with those required by the Final Scope. The Planning Board finds that the survey methodology and ensuing analyses were appropriate and adequate to justify the findings made herein.

As described above, 10.15 acres of the Site has been previously developed or altered, limiting wildlife and plant biodiversity. Approximately 9.43 acres of the Site comprise Terrestrial Cultural habitat, which have been previously impacted by human activity. Because of these disturbances and the proximity of the Site to roadways and



other development, the animal species found in this habitat are generally tolerant of human disturbance and capable of using of a variety of different habitats. The Site is not located within an unbroken forest corridor, and is separated from surrounding wildlife corridors by major roadways that inhibit wildlife migration (e.g., the TSP and Route 202/35.) Wetland A and upland areas to the north and west are wildlife corridors, but will be unaffected by the Project.

The Site also contains 4.25 acres of Successional Southern Hardwood Forest (wooded areas that contain second growth trees and have some impacts from invasive species of vegetation), 3.31 acres of Oak-Tulip Tree Forest (higher quality forest habitat located in the northwest portion of the Site), 0.61 acres of Successional Old Field habitat (fields that have been abandoned and left to revegetate) and 1.04 acres of wetlands and 4.66 acres of wetland buffer (discussed in greater detail in the “Wetlands” section below).

The Proposed Action will principally affect the Terrestrial Cultural, Successional Old Field, and Successional Southern Hardwood Forest habitats, which support plant and animal species that are tolerant of development-associated impacts. The proposed landscaping will replace vegetative losses with native species and enhance areas of the Site that are currently disturbed, providing new wildlife habitat. The proposed Landscaping Plan is contained in FEIS Appendix J, and will be subject to further refinement during the site plan review process.

The New York Natural Heritage Program has no known records of rare or State-listed animals or plants, significant natural communities, or other significant habitats on, or in the immediate vicinity of, the Site. The only federally-listed threatened or endangered species with potential habitat on the Site is the Indiana Bat, which was not detected in any of the field investigations. However, to avoid any potential impacts to the Indiana Bat, the cutting of potential roost trees will occur only between October 1 and March 31, when any such bats will be hibernating off-site. No state-listed threatened or endangered species were observed on Site, and the only species of special concern observed was the Eastern Box Turtle, one of which was detected on the west side the vernal pool in Wetland A. No development is proposed in Wetland Area A and a retaining wall will be constructed along the eastern side and approximately 80 feet east of Wetland A, separating box turtles from the proposed development while preserving other north-south migration pathways. As noted below (see subsection D.6), the Applicant's,

studies which utilized annual hydrological information, determined that changes to the water budget of the vernal pool in Wetland A will not cause significant impacts.

***Mitigation and Improvements for Impacts Related to Flora and Fauna***

- 
- a. Construction of a retaining wall on the westerly side of the parking area to minimize limit of soil/vegetative disturbance
  - b. Tree removal plan
    - i. The cutting of roost trees that could accommodate the Indiana Bat will be limited to the period between October 1 and March 31
  - c. Specific landscaping and maintenance plans
    - i. Five-year maintenance bond to ensure new plantings
    - ii. An approved planting list
    - iii. Installation and maintenance of a planting buffer in the NYS DOT right-of-way, including but not limited to the planting of approximately 100 evergreen trees
    - iv. Consideration of additional trees to be added within the parking lot
    - v. Deer protection options such as sprays, canopy netting, deer fence, etc.

**6. Wetlands, Groundwater and Surface Water Resources**

*The Planning Board finds that the Proposed Action will mitigate wetlands, groundwater and surface water resource impacts to the greatest extent practicable.*

The Town of Yorktown regulates wetlands and buffers of 100 feet adjacent to such wetlands. There are two Town-regulated wetlands located on the Site: one along the western property boundary (Wetland A) and one in the northeast corner (Wetland B). There are no state regulated wetlands on the Site; Wetlands A is a federally regulated wetland and contains a NYC DEP jurisdictional watercourse. Wetland A is a 0.91-acre, principally groundwater-fed, forested slope wetland with no inlet, which forms the headwaters of a small stream that flows through the wetland to areas off site to the southwest. Thus, Wetland A is a linear wetland. The northern-most portion of the wetland is seasonally ponded in most years and acts as a vernal pool. Wetland B is a 0.13-acre



forested slope wetland. Wetland B is hydrologically isolated and has no significant nexus to Wetland A or downstream waterways. Further, based upon functional analysis, Wetland B has limited ecological value. The majority of the Wetland B buffer is located either in a previously disturbed area or maintained lawn surface and as a result the current buffer serves limited function. The Applicant does not plan to have any stormwater discharge or changes to hydrology to Wetland B and has developed a mitigation plan to restore wetland buffer function.

The Proposed Action does not involve any direct disturbances to either Wetland A or Wetland B and it is consistent with the Yorktown Wetland Ordinance. The Proposed Action will disturb approximately 0.50 acres of the Wetland A buffer area (60 percent less than proposed in the DEIS Site Plan). Impacts to the buffer area were reduced due to the construction of a retaining wall along the western edge of the parking lot, which eliminates the need for an earth embankment in the buffer area. Any disturbed areas of the Wetland A buffer area will be re-vegetated with native species that will provide suitable habitat for birds and small mammals (per the Landscaping Plan).

The Proposed Action will disturb approximately 0.77 acres of the Wetland B buffer area, approximately half of which was previously disturbed by prior development. While the Wetland B buffer areas currently include several non-native and invasive species, following construction the buffer area will be re-vegetated with native species (per the Landscaping Plan).

As described herein, with the installation of the stormwater pre-treatment/infiltration system, the volume of stormwater discharges and associated pollutant loading to Wetland A will be reduced from existing conditions, an environmental benefit. Although Wetland A is hydrologically connected to Hunter Brook, Sherry Brook and the New Croton Reservoir, the improvements in the stormwater management system on the Site will avoid any negative impacts on Hunter Brook and other downstream surface water resources. Because there will be a reduction in runoff volume, the potential for downstream flooding will not increase, and the overall hydrology of the downstream watercourses will not be significantly impacted. Treated stormwater from the infiltration system will be released back into to the soil upgradient of Wetland A, recharging the groundwater table from which the wetland is primarily fed, thus maintaining the existing conditions.

The Applicant conducted a thermal analysis, which demonstrates that there will not be any thermal loading to Wetland A. In response to NYC DEP and Watershed Inspector General comments on pollutant loading, the Applicant's pollutant loading analysis was revised to include incorporation of Jellyfish<sup>®</sup> Filter units as further described in Section D.7 below (Stormwater Management). Even if the pollutant removal rates for the infiltration system and the lateral movement of stormwater through soil is reduced by 50% from those used in the FEIS, the post-development loads for all stormwater pollutants aside from nitrogen are reduced from pre-development conditions, and the slight increase in nitrogen is not anticipated to have any significant impacts on the Wetland or downstream water bodies. Refer to The TRC Letter & Appendices, December 5, 2014, Appendix C Table 1. Excess nitrogen compounds in stormwater runoff are usually converted into atmospheric nitrogen gas (N<sub>2</sub>) by denitrifying bacteria in freshwater systems, without any significant impacts. Therefore the Planning Board finds that there will be no significant adverse impacts with respect to pollutant loading to Wetland A.

The Applicant's water budget and hydrological analyses (revised to address comments on the DEIS and the FEIS) support that there will be no significant hydrological impacts to Wetland A. The Planning Board will require the installation of test wells to monitor actual hydrological and pollutant loading conditions on a real time basis. Data from the test wells will be collected on a quarterly basis by the Applicant or its agents and such data shall be submitted to the Town Planning and Engineering Departments. This monitoring will be required for a period of time to be determined by the Planning Board during Site Plan review. If necessary, engineering solutions, such as metering or dispersing stormwater, may be implemented to address the fluctuations of the hydrology to Wetland A. Such engineering solutions will be shown on an approved Site Plan.

***Mitigation and Improvements for Impacts Related to Wetlands, Groundwater and Surface Water Resources***

- a. The installation of wells to monitor the hydrology of Wetland A



- b. See also landscaping improvements and mitigation identified in Sections D.2 (Visual Impacts) and D.5 (Flora and Fauna) herein
- c. The approved Site Plan shall reflect post-FEIS changes identified herein
- d. The approved Site Plan shall identify engineering solutions to address fluctuations in hydrology of Wetland A

## **7. Stormwater Management**

*The Planning Board finds that the Proposed Action will mitigate stormwater impacts to the greatest extent practicable.*

The Applicant's consultants (TRC Engineers, Inc. and HDR, Inc.) conducted extensive studies of stormwater runoff, water quality treatment and pollutant loading, and prepared a preliminary SWPPP, all of which are contained in FEIS Appendix E. Overall, the stormwater management design exceeds the minimum State requirements by treating areas previously developed as undeveloped and natural, which in turn requires the imposition of more stringent standards to these areas, and thus for the Project. The SWPPP is required to meet the regulatory requirements of the NYSDEC, NYCDEP and the Town of Yorktown.

In response to comments received from the general public and various agencies, the Applicant modified the DEIS Site Plans and stormwater management design for the Proposed Action, enhancing the stormwater management and treatment capacity. In particular, the Applicant enlarged the stormwater infiltration system in order to capture, recharge, and treat 100% of the water quality volume from a one-year storm (also known as a "water-quality storm") within the New York City East-of-Hudson Watershed. Prior to entering the infiltration system, stormwater runoff will be pre-treated in subsurface, hydrodynamic structures, designed in conformance with the NYSDEC Stormwater Management Design Manual. These pre-treatment structures will capture floatable litter and pollutant-laden sediment. From these pre-treatment structures, stormwater will be conveyed to three subsurface storage chambers and a subsurface storage and infiltration chamber, which will provide further treatment. In response to post-FEIS comments, the Applicant has enhanced the design of the stormwater management system by adding Jellyfish® Filter units, a proprietary stormwater pre-treatment and filtering practice. In

addition, in response to comments on the FEIS, the Applicant has modified its calculations and stormwater design by using recently published rainfall distribution data from the Northeast Regional Climate Center (NRCC). As a result of this new rainfall data the design has been expanded to include a new 28,000 cubic foot stormwater storage chamber.

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Site-specific field testing to determine soil characteristics and percolation rates was performed at multiple locations throughout the Site to determine the best location for the infiltration chamber. With this stormwater management system, runoff and rate of runoff leaving the Site from the 1-year, 2-year, 10-year, 25-year, 50-year, and 100-year storms will all be reduced compared to existing conditions, resulting in no adverse change in flood risk to Hunter Brook and other downstream water bodies as compared to existing conditions.

Runoff from the fueling facility will be captured and conveyed to separate perimeter sand filter systems, with the drain inlet grates for each perimeter sand filter fitted with inserts containing filters with a special “sorb” type media specifically designed to trap hydrocarbons, metals and silts carried in the runoff. Following this pretreatment, this runoff will be conveyed to the on-Site subsurface infiltration system.

Runoff from off-site road improvements will be captured in roadside storm drains and diverted to the subsurface infiltration system on the Site or to localized bioretention basins and swales, capturing and treating 100% of the water quality volume from the one-year storm. Under all storm events, runoff from the improved areas of Route 202/35 and other roadwork will be reduced to below pre-development volumes and treated to improve water quality.

As noted earlier, the Applicant’s consultants performed thermal and pollutant loading studies for stormwater associated with the Project. With the proposed water quality treatment, stormwater runoff will not result in any thermal impacts to Wetland A or downstream water bodies. The stormwater management system will reduce temperatures in Site runoff during the summers, and all projected changes in temperature are consistent with NYSDEC regulations and will not adversely affect the Site wetlands or downstream waterbodies.

The Applicant also performed a quantitative pre- and post-development pollutant loading analysis (FEIS App. E.). The analysis was conducted in accordance with



NYSDEC's Stormwater Management Design Manual (NYSDEC, August 2010) and Reducing the Impacts of Stormwater Runoff from New Development (NYSDEC, April 1992), and employed state-of-the-art modeling. The analysis assumed that 12-18 feet of soil media is necessary to provide adequate lateral treatment for pollutant reduction beyond the infiltration chamber itself; however, the actual lateral distance from the chamber to Wetland A is approximately 150 feet.

The analysis found that the Proposed Action will significantly reduce the annual loading of organic water pollutants, total nitrogen, total phosphorus, total suspended solids, lead, copper, zinc and oil and grease to Wetland A and from the Site, as compared to existing conditions – the full range of pollutants typically associated with stormwater runoff in suburban areas. This reduction in annual pollutant loading, resulting from the improvements to runoff retention and treatment on Site, will not adversely affect water quality in Wetland A and downstream water bodies, including Sherry Brook, Hunter Brook and the New Croton Reservoir, and will likely improve it as compared to current conditions.

Post-FEIS comments raised the concern that there would be no treatment of pollutants in stormwater after discharge from the infiltration chamber because the water would travel too quickly through the soil media. Although it is the Applicant's consultants' position that the infiltration practice will provide further treatment, the Applicant added Jellyfish<sup>®</sup> Filter units as pre-treatment practice, and conducted pollutant loading studies taking a reduced credit for infiltration practice. Even taking only a 50% credit for infiltration through the soil after stormwater leaves the chamber and then moves laterally through the subsoil, pollutant loading from the Site will be substantially reduced as compared to existing conditions. Refer to The TRC Letter & Appendices, December 5, 2014, Appendix C Table 2. The infiltration system as described and depicted in the FEIS, together with the additional enhancements set forth in The TRC Letter & Appendices, December 5, 2014 more than satisfy the Final Scope and the level of detail required by SEQRA. The Site Plan will be revised to reflect the enhancements described herein and further details and refinements will be developed during the site plan review process.

A water balance analysis was conducted to determine potential impacts of the new stormwater infiltration system on the hydrology of Wetland A. This analysis concluded

that the Proposed Action will affect the water depth of Wetland A by less than half an inch, which will not result in any significant impacts. The Project will affect the vernal pool by less than a quarter inch, which will not affect the functions and values of the pool.

The Proposed Action will not add paved impervious areas within the contributing drainage area to Wetland B. Existing vegetation within that area will remain unchanged. Wetland B will be unaffected by Project-generated stormwater runoff, and its current hydrology will be maintained. Therefore, no increase to thermal or pollutant loads to Wetland B will result from the Proposed Action, and Wetland B's easterly buffer will be enhanced by supplemental plantings in the Proposed Action's Landscape Plan (see FEIS Appendix J.)

Limited amounts of deicing agents, for example bags of salt, will be stored inside the Costco building and applied to on-Site sidewalks to improve safety during snow and ice events. The application of deicing agents to on-Site roadways and parking areas will be performed by an outside contractor, reducing the need to store large quantities of such agents on Site. The use of ice control agents will be governed by NYCDEP's Rules and Regulations for the Protection from Contamination, Degradation and Pollution of The New York City Water Supply and its Sources, therefore only ice control agents allowed in the NYC DEP watershed will be utilized. Agent-containing runoff will be treated in the Proposed Action's stormwater management facilities. All applicable regulations regarding deicing will be followed including appropriate storage of ice control agents on the site.

#### ***Mitigation and Improvements for Impacts Related to Stormwater***

- a. Maintenance plan for mechanical pre-treatment
- b. Maintenance of all stormwater facilities and related infrastructure
- c. Enlargement of the proposed stormwater infiltration system, in order to improve on-site and offsite stormwater treatment
- d. Addition of separate water quality treatment for stormwater runoff from the proposed fueling facility, in order to improve on-site stormwater treatment



- e. Addition of new stormwater treatment practices addressing runoff from the road improvements to be undertaken by the Applicant, in order to improve off-site stormwater treatment
- f. Installation of Jellyfish<sup>®</sup> Filter units will be used in series with the Vortech<sup>®</sup> units to pre-treat stormwater before it is discharged the subsurface infiltration system already included in the FEIS
- g. Installation of a 28,000 cubic foot stormwater storage chamber connected with the detention basin (as shown in Figure 1 of Appendix D of The TRC Letter & Appendices, December 5, 2014) to attenuate the post-development runoff rates to pre-development levels from the 50- and 100-year storm using the new Northeast Regional Climate Center (NRCC) rainfall values
- h. The approved Site Plan shall reflect post-FEIS changes identified herein
- i. Applicant will submit a revised SWPPP to the Watershed Inspector General (WIG) at the same time it makes submissions to the NYCDEP

## 8. Utilities

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on utilities.*

### Water

The anticipated daily water usage for the Proposed Action (on average approximately 5,500 gallons per day based on historic usage at other Costco facilities) can be accommodated by the Yorktown Water District. Two connections to the Town's water distribution system will be made; one to the existing 8-inch main in Route 202/35 and second to the existing 6-inch main in Old Crompond Road. The second water supply connection will provide enhanced reliability of water service in the event of an offsite interruption of service from one of the service mains. Water usage on Site will be minimized through the use of water conservation technologies (e.g. water saving restroom faucets, urinals and toilets) within the Costco building.

### Sanitary Sewer

The Project Site is located partially within the existing local Hunter Brook Sewer District #17 ("HBSD"). To extend sewer service to the entire Site, as well as neighboring properties along Old Crompond Road, the Proposed Action includes the formation of a

new local HBSD #20. The new sewer main will be constructed within the Town and NYSDOT rights-of-way, and after the sewer is installed the affected portions of the roads will be resurfaced.

The extension of sewer service will provide a benefit to the local area, facilitating the use of public utility systems and the abandonment of individual septic systems in the area, which currently discharge to groundwater. The extension will be beneficial to water quality in the NYC watershed. All new water main and sewage system improvements and appurtenances will be installed at the Applicant's cost and in accordance with the standards and specifications of the Town of Yorktown and the Westchester County DOH. The Proposed Action will generate tax revenues for the Town's Hunter Brook Sewer District of \$47,813, and the Consolidated Water District of \$13,215 that will offset operating costs.

The Proposed Action will generate on average 5,000 gallons of sewage per day (gpd) based on historic flows at other Costco facilities. Based on NYSDEC sewage loading factors, typical sewage generation for commercial use would be 15,000 gpd. The residential properties within the extended sewer district will generate approximately 6,515 gallons per day. Although the proposed Costco will generate flow (5,000 gpd), which is less than that estimated using NYSDEC criteria (15,000 gpd), the proposed and existing downstream infrastructure, including the Hunter Brook pump facility, has capacity to handle the 15,000 gpd flow.

Within FEIS Section VI, potential additional development was analyzed assuming rezoning of the residential properties north of Old Crompond Road to multi-family zone R-3. Based on the assumed rezoning, the study analyzed 140 multi-family residential units; which would generate 34,500 gallons of sewage per day. The Town Board has recently received an application to rezone certain residential properties north of Old Crompond Road within the enlarged sewer district to RSP-1 (Age-Oriented Community District) and C-2 (Commercial Hamlet Center District). The proposed development included 96 senior residential units and 47,500 square feet of commercial space having a 50/50 mix of office and retail use. If such rezoning were approved, the properties could generate 27,000 gallons of sewage per day, which is less than that studied in the FEIS. For further discussion see Section D.19 herein (Induced Growth).



In the event that extension of the offsite sanitary sewer system is not permitted, a Preliminary Alternate Sewage Disposal System Report, located in Appendix I of the FEIS, indicates that on-site wastewater treatment and disposal is a feasible alternative, although on site treatment will not offer the same benefits to the surrounding community. Should construction of the alternate sewage treatment and disposal facility be necessitated, final design in accordance with NYSDEC, NYCDEP and Westchester County DOH design standards will be required and applications will be made. As noted, this change would also require a site plan amendment from the Planning Board.

#### Electricity, Gas, Cable and Telecommunications

Electric service is provided to the Site by Consolidated Edison (Con Ed). Natural gas service, also provided by Con Ed, will be extended to the Site and the surrounding area as part of the Proposed Action, providing a benefit to the community. The new gas main will be constructed within the Town and NYSDOT rights-of-way, in the same area as the new sewer main.

The Proposed Action will increase electricity demand by approximately 0.5 million kilowatt/hours and increase natural gas demand by 54,700 Therms natural gas per year. Con Ed has indicated that it has sufficient capacity to provide service for the Proposed Action without requiring improvements.

Telecommunications and TV services to the Site are provided by AT&T, Verizon, and Cablevision, all of which have sufficient capacity to accommodate the Proposed Action.

#### ***Mitigation and Improvements for Impacts Related to Utilities***

- a. Creation of the Hunter Brook Sanitary Sewer District #20 and expand the Peekskill Sewer District
- b. Installation of all new water main and sewage system improvements and appurtenances at the Applicant's cost and in accordance with the standards and specifications of the Town of Yorktown and the Westchester County DOH
- c. Should construction of the alternate sewage treatment and disposal facility be necessitated, this change would require a site plan amendment from the Planning Board

- d. The new sewer main will be constructed within the Town and NYSDOT rights-of-way, and after the sewer is installed the affected portions of the roads will be resurfaced to the satisfaction of the Planning Board

## **9. Use and Conservation of Energy**

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*The Planning Board finds that the Proposed Action will not have a significant adverse impact on use or conservation of energy.*

The Proposed Action will use approximately 1.032 million kilowatt hours (kWh) of electricity annually, an increase of 0.532 kWh from the operation of all existing uses of the Site. Annual natural gas usage for the Proposed Action will be approximately 54,700 Therms. To increase energy efficiency and limit energy usage, the Project will employ a variety of energy saving technologies, resulting in an annual reduction of 0.663 kWh and 379 tons of greenhouse gas (“GHG”) emissions compared to a similarly-sized building constructed pursuant to current energy codes.

These energy-saving technologies include the use of insulated textured wall panels to reduce heating, ventilation and air conditioning (“HVAC”) requirements, skylights and photo sensors to reduce interior lighting requirements, a solar reflective “cool white” roof, a heat reclaiming system that captures heat from the building’s refrigeration lines, high efficiency restroom fixtures, an extensive waste stream reduction and recycling program, and LED luminaires. The Proposed Action includes a subsurface infiltration system that will accept roof water runoff, which will result in similar thermal benefits to roof water runoff as compared to a green roof.

The Proposed Action allows for a curb lane or shoulder for bicycle use as well as pedestrian sidewalks and adds a new bus stop along Route 202/35 to encourage alternate means of transportation by Costco employees and the public at large. Further enhancement or modification of the design is likely to occur during site plan review to maximize the pedestrian and bicycle connections within the Bear Mountain Triangle.

### ***Mitigation and Improvements for Impacts Related to Use and Conservation of Energy***

- a. Utilization of energy-saving technologies such as the use of insulated textured wall panels to reduce HVAC requirements, skylights and photo sensors to reduce interior lighting requirements, a solar reflective “cool white” roof, a heat



reclaiming system that captures heat from the building's refrigeration lines, high efficiency restroom fixtures, an extensive waste stream reduction and recycling program, and LED luminaires

- b. The Planning Board will consider the installation of a charging station for electric cars at the site
- c. The following public transportation enhancements shall be conditions of improvement and must be completed prior to issuance of Certificate of Occupancy:
  - i. Construct a sidewalk on Route 202 from Strang Boulevard extending west to Old Crompond Road and on-site extending to the Costco Warehouse
  - ii. Construct bus stop improvement at Route 202 and Strang Boulevard
  - iii. Add bus stop on Route 202 at the site frontage
  - iv. Provide paved shoulder/bikeway to Route 202/35 improvements
  - v. Provide bike parking on Site (and option to add more)
  - vi. Prohibit idling by delivery trucks in accordance with applicable laws

## **10. Solid Waste**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on solid waste.*

Solid waste generated by existing uses on the Site is currently removed and disposed of by the Town of Yorktown (for residential properties) and private carters (for commercial properties). Municipal solid waste in Yorktown is currently disposed of at the Charles Point Resources Recovery Facility in Peekskill, New York.

Based upon data provided for a similar Costco facility in Nanuet, New York, the Proposed Action will generate approximately 1,650 tons of solid waste per year, approximately 45% of which will be recyclable and 55% of which will be compacted on site and disposed off-site. Non-recyclable waste will be transported to the Charles Point Facility, which is currently operating under capacity and will be able to accept and process such waste. Recyclable waste will be sorted on site and transported to various recycling transfer facilities in the region, depending on the material. Pursuant to the

Westchester County Source Separation Law, Costco will prepare a Nonresidential Waste Generator Plan that describes the separation of and collection schedule for recyclable materials. Costco will also employ a corporate waste stream control and reduction program, which promotes the reuse or recycling of shipping materials, cooking grease from rotisserie equipment, and organic food waste from unsold or spoiled food, not including the food court.

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***Mitigation and Improvements for Impacts Related to Solid Waste***

- a. Comply with the Westchester County Source Separation Law and prepare a Nonresidential Waste Generator Plan that describes the separation of and collection schedule for recyclable materials
- b. Implement a corporate waste stream control and reduction program, which promotes the reuse or recycling of shipping materials, cooking grease from rotisserie equipment, and organic food waste from unsold or spoiled food

**11. Traffic**

*The Planning Board finds that the Proposed Action will mitigate traffic impacts to the maximum extent practicable.*

A traffic impact study was prepared by the Applicant's traffic consultant (Maser Consulting, P.A.) for the DEIS, and revised in the FEIS based upon comments from the Town's traffic consultant (Jacobs Civil Consultants, Inc.) and the public. The Revised Traffic Impact Study, which uses the latest traffic analysis software, is contained in FEIS Appendix G, last revised October 3, 2014. Maser Consulting also submitted a letter dated November 17, 2014, which responded to comments received on the FEIS submitted by Michael Maris Associates.

The Revised Traffic Impact Study includes an analysis of (a) existing peak traffic conditions on the roadway networks surrounding the Proposed Action, (b) future peak conditions in the absence of the Proposed Action (the "No Build" scenario) and (c) future peak traffic conditions with the Proposed Action. The capacity analysis took into consideration, consistent with state-of-the-art traffic methodology, truck traffic, pedestrian activity, roadway grades, lane geometry, and traffic signal timing and other engineering factors at the intersections (both signalized and unsignalized) and roadways assessed. The



study used the current models for traffic studies, including the Synchro Version 8 model, which incorporates the 2010 Highway Capacity Manual methodology. The analysis determined the Levels of Service and average vehicle delays at these intersections, and compared the current conditions in the Build Year to those without and with the Project at that time.

Traffic volumes were based on current counts conducted at study area intersections as well as historical data available from other studies completed between 2000 and 2010. The Applicant conducted traffic counts during September 2009, October and November 2010 and February 2011 by representatives of Maser Consulting, P.A. (during the Weekday AM, Weekday PM and Saturday Peak Hours). (A full inventory of the traffic count dates for each of the study area intersections is provided in Table I-1 of the Revised Traffic Impact Study.) Supplemental counts were taken in November 2013 to assure that the traffic counts used in the Revised Traffic Impact Study continue to be representative of current conditions. (As discussed in Section II.B and Summarized in Table EX-1 of the Revised Traffic Impact Study, these counts reflected a decline in traffic; thus, using the prior traffic data yielded a conservative result.) In addition, the Applicant reviewed and utilized traffic counts and related information from other studies conducted in the area, as well as data available from the NYSDOT. The existing traffic volumes were increased by a conservative growth factor of 2% per year to account for re-occupancy of currently vacant area facilities and general background growth (conservative because recent NYSDOT data indicate a background growth rate of only 0.3% annually), as well as by traffic associated with proposals, as described in Response III.K6c and in Section III.A of the Revised Traffic Impact Study, that might come on line by the Proposed Action Build Year of late 2015/early 2016.

Trip generation estimates for the Proposed Action were based upon the Institute of Transportation Engineers' ("ITE") Trip Generation (8th ed. 2008), which are more conservative than the estimates in the 9th edition of the ITE's Trip Generation from 2012. These trip generation estimates were supported by an analysis of peak traffic data from Costco's stores in Nanuet, New York and Brookfield, Connecticut, which, like the Proposed Action, include a fueling facility. In total, the Proposed Action is anticipated to generate 86 new trips/hour during the weekday morning peak, 480 new trips per hour during the weekend evening peak, and 776 new trips/hour during the Saturday peak

(counting entry and exit of a single vehicle as two separate trips). The majority of this traffic will access the site from the Taconic State Parkway and the 202/35 corridors, and will not utilize smaller local roads surrounding the Site. These trip generation estimates account for expected “internal trips” for vehicles that will visit both the Costco store and fueling facility in the same trip based on observations at other existing Costco facilities, as well as a 25% credit to account for vehicles attracted from the existing traffic flow along Route 35/202 and the TSP.

In response to comments from the Town’s traffic consultant and the public, as part of the Revised Traffic Impact Study a separate sensitivity analysis was completed to evaluate conditions utilizing higher traffic generation figures for the Proposed Action. This analysis, included in Appendix E of the Revised Traffic Impact Study, used higher “total external trips” than were estimated for the existing Nanuet, New York; Brookfield, Connecticut; Melville, New York; and Hackensack, New Jersey Costco locations. Even with these higher trip volumes, the analysis confirmed that overall intersections proximate to the Site will experience reduced delays and shorter queues as a result of the Applicant-funded improvements.

Based upon the Revised Traffic Impact Study, the Applicant will undertake a series of improvements to the roadway section of Route 202/35 between Strang Boulevard and Old Crompond Road. These include the widening of Route 202/35 to provide a new westbound through lane (which matches into the recently completed NYSDOT improvements) and an added eastbound left turn storage lane, which would result in separate dedicated eastbound and westbound left-turn storage lanes for vehicles turning onto the northbound and southbound TSP. The provision of these full storage length turning lanes will allow through traffic to move freely through the interchange area and remove the current restriction of blocked through traffic as a result of the inadequate length of the existing left turn lanes. The Applicant will also provide a new sidewalk on the north side of Route 202/35 between Strang Boulevard and Old Crompond Road, new crosswalks and pedestrian signals, a new Bee-Line bus stop, new shoulders wide enough to accommodate bicycles, and intersection signal timing and coordination improvements (See FEIS Site Plan Introductory Exhibit 5). With these



improvements, as well as complementary NYSDOT-sponsored roadway improvements<sup>5</sup> surrounding the Site that have already been completed, the Proposed Action will maintain or improve overall operating conditions at 13 of the 16 intersections studied in the FEIS, including substantial improvements on Route 202/35 at its intersections with the northbound and southbound TSP ramp intersections. (Reducing overall intersection traffic delays during the peak weekday evening and Saturday peak periods by 68.9 and 77.1 seconds, respectively.) This will also reduce the delays to emergency vehicles through this section of the corridor.

The only intersections where overall traffic Levels of Service will decline are Route 202/35 and Strang Boulevard (Saturday peak with delay increase of between 8 and 9 seconds), Route 202/35 and Baldwin Road (weekday evening and Saturday peak with delay increase of between 10 and 14 seconds) and Route 202/35 and Granite Springs/Mildred E. Strang Middle School (Saturday Peak including high school event conditions with delay increase of between 11 and 12 seconds). The increased delays of the Granite Springs/Mildred E. Strang driveway would only occur on Saturdays during event conditions (i.e., when a high school sporting event is occurring). The Planning Board finds that these additional delays are brief and not significant. It should be noted that as indicated in Footnote 7 of the Level of Service Table contained in the Revised Traffic Impact Study, that under existing and “No-Build” conditions on Saturday the Strang Boulevard intersection is impacted by queues, which extend from the TSP ramp intersections. Thus, under the Build conditions, this location will actually be improved as a result of the Applicant’s improvements to add the westbound lane, which will remove

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<sup>5</sup> In June 2014 NYSDOT completed major improvements on the NYS Route 35/U.S. Route 202 corridor and the Bear Mountain Parkway (“BMP”) Extension as part of PIN 856134. These improvements extend from the west beginning in the vicinity of the existing Snap Fitness building, past the Parkside Corner Shopping Center and involved the construction of improvements to the intersections of NYS Route 35/U.S. Route 202 and Bear Mountain Parkway Extension, NYS Route 35/U.S. Route 202 and Pine Grove Court, NYS Route 35/U.S. Route 202 and Stony Street/BJ’s-Staples Plaza, and Bear Mountain Parkway and (BMP) Stony Street. The NYSDOT improvements provide two through lanes in each direction on NYS Route 35/U.S. Route 202 between the Parkside Corner shopping center to the west and Old Crompond Road to the east. The area between the BMP and Parkside Corner now also has a center turn lane providing a dedicated lane for left turns into the businesses located along the south side of NYS Route 35/U.S. Route 202. Additional turning lanes were also constructed at the Pine Grove Court and BJ’s/Stony Street intersections and a new coordinated traffic signal was installed at the Pine Grove Court intersection. These improvements also included the construction of a complete sidewalk system between Old Crompond Road and the Parkside Corner shopping center. A further detailed discussion of the NYSDOT Improvements is provided in the FEIS Section III.K Introductory Response.

the current bottleneck at the Route 202/35 and the northbound off ramp intersection. As previously mentioned, in response to comments from the Town's traffic consultant and the public, the Applicant conducted a detailed sensitivity analysis of each of the study area intersections based upon potentially higher trip generation estimates than those used in the DEIS Traffic Study analysis. This analysis confirms that, even under increased trip generation assumptions, traffic associated with the Proposed Action can be accommodated without a significant adverse impact on operating conditions after completion of the Applicant's proposed improvements (as listed and described in Appendix A of this Finding Statement).

Finally, the Planning Board required the Applicant to consider the cumulative impacts of all nearby development that was likely to be constructed before the build year of the Project. Therefore, with respect to nearby projects such as State Lands development and BJ's proposed fueling station (both of which are expected to be completed after Proposed Action) environmental impact review for such projects will include the impacts associated with the Proposed Action.

#### ***Mitigation and Improvements for Impacts Related to Traffic***

- a. Construct Route 202/35 Improvements, including added westbound through lane, added dedicated left turn lane, upgraded existing traffic signals (see Appendix A to this Finding Statement for details of specific traffic improvements) in accordance with the approved site plan and traffic improvement plan
- b. Widening of Route 202/35 and addition of a new westbound turning lane on Route 202/35, in order to improve circulation onto the TSP access ramps and reduce delays
- c. See Mitigation and Improvements for *Energy & Green Technology*, as set forth in Section D. 9 hereof
- d. Adhere to the Maintenance and Protection of Traffic Plan for construction
- e. Extension of the pedestrian sidewalk from Route 202/35 to the building entrance and addition of bicycle parking racks, in order to promote bicycle and pedestrian access<sup>6</sup>

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<sup>6</sup> The FEIS assessed Costco's traffic impacts in terms of trip generation, capacity of local roadway networks, and delays at intersections. However, recent planning literature has emphasized the relationship between low density land uses and public health.



- f. Sidewalk maintenance and snow/ice removal
- g. Fueling facility is for Costco members only. and diesel fuel will not be sold on the site
- h. Construction activities including hours of work will be finalized with the Town as part of the site plan approval process. Also note that construction activities including hours of work will be finalized with the Town as part of the site plan approval process
- i. At the request of the NYSDOT, the Applicant will install back plates to the westbound approach of the traffic signals to reduce the effects of sun glare
- j. Adjust signal timing on traffic signals from Strang Blvd to Stony Street
- k. Add phasing changes at Mohansic Avenue to mitigate left turn accidents
- l. No Certificate of Occupancy will be issued until all traffic related improvements (e.g., sidewalks, roadways, intersections), except signalization timing changes, are complete
- m. Add bus stop on Route 202 at the site frontage
- n. The Planning Board will also consider the creation of a Costco sponsored bus loop from the Project Site to the Staples Plaza with stops at proposed commercial development along Crompond Road
- o. The Planning Board will consider a requirement to construct an extension of the North County Trailway to FDR Park, providing bicycle and pedestrian access to the park from many parts of the county
- p. See also Appendix A hereto

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Researchers have examined whether land development designed to complement automobile-based transportation leads to less physical activity for residents as they drive – rather than walk – to their destinations and whether this, in turn, affects public health. Since designing large scale projects to invite automobile access often makes them more difficult to access via other forms of transportation (mass transit, pedestrian, bicycle), it is significant that this Project includes features to promote pedestrian and mass transit travel. The Planning Board may recommend additional remediation or enhancements to encourage alternative forms of transportation (non-automotive) during the site plan review.

## 12. Parking

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on parking.*

The construction of the Costco store and fueling facility does not have a specifically prescribed parking requirement under the Yorktown Zoning Code (Chapter 300-182). Costco is neither a purely retail nor wholesale establishment, but rather provides bulk goods to both individual consumers and local businesses. Therefore, the Zoning Code authorizes the Planning Board to determine “reasonable and appropriate off-street parking requirements” for the Proposed Action, based upon “all factors entering into the parking needs of each such use.” Zoning Code 300-182(B).

The Planning Board finds that the 610 parking spaces proposed by the Applicant are reasonable and appropriate, based upon a number of factors and supporting analyses. The ITE has recognized Discount Clubs like Costco as a distinct land use with its own parking requirements, and has estimated peak parking demand (85<sup>th</sup> percentile) of 3.93 spaces/1,000 square feet of floor area. Applying this ratio to the Proposed Action will yield a total of 594 parking spaces, 16 fewer than the amount proposed by the Applicant.

The NYSDEC Stormwater Management Design Manual recommends a parking ratio of 3.97 spaces/1,000 square feet of shopping center floor area, which it states will “accommodate most of the demand” while “eliminating unneeded spaces” that increase runoff from paved surfaces. Applying this ratio to the Proposed Action will yield a total of 600 spaces, 10 less than the amount proposed by the Applicant.

The Applicant also conducted a parking demand analysis (FEIS Appendix H), based upon door counts at five Costco stores within the region, during the November/December 2012 peak shopping season. These stores had peak parking ratios that varied from 3.08 spaces/1,000 square feet of floor area to 4.78 spaces/1,000 square feet, with the three lowest ratios found at the three largest stores. The Project will be larger than the five stores covered by that analysis, and is thus likely to have a parking demand ratio on the lower end of that range.

The Applicant supplemented this analysis with a parking utilization study at the Costco stores in New Rochelle (which is 136,000 square feet) and Nanuet (which is 120,000 square feet). The study was performed on Friday, November 23, 2013 (“Black Friday”), Saturday, December 1, 2012, and Sunday, December 2, 2012, to determine



actual peak annual parking demand at stores with the same amenities as the Proposed Action (e.g., a fueling facility and tire service center). The analysis revealed that peak parking demands of 541 spaces occurred over a 1-hour interval at the New Rochelle store and 520 spaces occurred at the Nanuet store over a 30-minute interval. This translates to parking indices of 3.95 and 4.31 spaces/1,000 square feet at the New Rochelle and Nanuet stores, respectively.

Parking requirements are not designed to meet the heaviest shopping days of the year as such a standard would result in significant excess pavement and unused spaces for the remainder of the year. It is also noted that the analysis (FEIS III.L) indicates that the larger stores had lower parking indices. If the 3.95 parking index observed for the New Rochelle store during peak shopping time is applied to the Proposed Action, the parking requirement would be 597 spaces. Therefore, the 610 spaces proposed by the Applicant (4.04 spaces/1,000 square feet) is consistent with the analysis and would be sufficient to meet the parking demand for all but a few hours of the year. See FEIS Appendix H for the Parking Utilization Study.

The Planning Board notes that in January 2013 the Yorktown Town Board amended the Town Zoning Code to reduce the parking requirements for retail uses within commercial zones from 5 spaces/1,000 square feet to 4 spaces/1,000 square feet. Yorktown Zoning Code §300-182(A)(3). While this amendment does not apply to the Proposed Action, which had a pending site plan application at the time of the change, the justification for the reduction – including trends in published data and municipal parking requirements – supports the Planning Board’s finding that a 4.04 space/1,000 square feet ratio is “reasonable and appropriate” for the Proposed Action. Yorktown Zoning Code §300-182(B).

#### ***Mitigation and Improvements for Impacts Related to Parking***

- a. Provide paved shoulder/bikeway to Route 202/35 improvements and consideration of provision for additional on Site bike parking in the future
- b. Consideration of additional trees to be added within the parking lot
- c. Add bus stop on Route 202 at the site frontage and bus stop improvement at Route 202 and Strang Boulevard

### 13. Air Quality

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on air quality.*

The Proposed Action is located within Westchester County, NYSDEC Region 3, which is in attainment with or exceeds the National Ambient Air Quality Standards ("NAAQS") for sulfur dioxide ("SO<sub>2</sub>"), inhalable particulates ("PM<sub>10</sub>"), fine particulates ("PM<sub>2.5</sub>"), nitrogen dioxide ("NO<sub>2</sub>"), carbon monoxide ("CO"), and lead ("Pb"). Westchester County is in non-attainment with NAAQS for ozone (O<sub>3</sub>). The Applicants' consultant (TRC Engineers, Inc.) analyzed potential air quality impacts from (a) vehicle emissions, (b) construction activities, and (c) operation of the store.

With respect to vehicle emissions, the principal contaminant of concern is CO. Potential impacts from traffic generated by the Proposed Action were analyzed pursuant to the NYSDOT's Environmental Procedures Manual, which sets forth a three-step screening process to determine if more detailed air quality analysis (which will include modeling) is required. Based upon this screening process it was determined that most of the intersections in the study area do not have sufficient congestion to warrant additional analysis, and the remaining intersections (a) will not be substantially impacted by the Proposed Action and (b) do not have high enough overall peak traffic volumes to warrant additional analysis. Therefore, traffic generated by the Proposed Action will not have a significant impact on CO levels, and refined air quality modeling is not required. Moreover, roadway and signal timing improvements to be implemented by the Applicant will reduce idling times on surrounding roads, improving local air quality.

Potential impacts from vehicles in the Costco parking area were analyzed pursuant to the New York City Environmental Quality Review (CEQR) Technical Manual (as NYSDOT has no comparable guidance). This analysis revealed that the projected impacts from parking lot emissions, adjacent street traffic and background CO levels are far below the CO NAAQS, such that no significant impacts from vehicles in the parking lot (including idling, queuing, and searching for parking spaces) will occur. The pumps at the proposed fueling facility will utilize Stage II vapor recovery devices that capture gasoline vapors displaced from vehicle fuel tanks during refilling and return them to the bulk storage tanks, thus preventing emissions of gasoline vapors.



The Proposed Action will produce air emissions relating to the operation of the HVAC requirements for the Costco store. The Proposed Action is not expected to be classified as a major air-emitting source pursuant to EPA and NYSDEC regulations because the Proposed Action has no major stationary sources emitting significant quantities of pollutants. Emissions associated with the HVAC operations will comply with all applicable state and federal regulations and will not exceed any NAAQS.

Construction activities, which may include rock crushing, drilling and blasting, have the potential to temporarily increase dust and criteria air pollutant emissions. Such typical construction impacts will be minimized by covering trucks carrying soils and other dry materials; covering exposed stockpiles of soil and gravel; applying water to stockpiles, unpaved roads, and paved surfaces during dry periods; promptly grading and landscaping exposed areas; enclosing the rock crushing facility and installing a dust extraction and collection system; imposing speed controls for vehicles on unpaved roads; and other measures identified in the FEIS. Dust suppression from any hazardous materials will be addressed through hazardous material protocols and Health and Safety Environmental Monitoring Procedures as set forth in the EHASP/CAMP (DEIS Appendix B4) and dust suppression from construction related activities will be addressed in the final SWPPP.

### **Mitigation and Improvements for Impacts Related to Air Quality**

- a. Proper maintenance of construction equipment
- b. Minimization of vehicle idling per DOT Environmental Procedures Manual
- c. Control fugitive dust by:
  - i. Maintaining low vehicular onsite speed
  - ii. Covering trucks carrying soil
  - iii. Covering exposed stockpiles of soil and gravel
  - iv. Periodic washing of paved areas to suppress dust suspension
  - v. Expediently landscaping exposed final graded areas
- d. Minimize air dust from rock crushing by:
  - i. Regular watering of site during dry weather

- ii. Enclosing rock crushing facility, if practical
  - iii. Vehicle wheel washing facility
  - iv. Onsite fugitive dust monitoring program
- 
- e. Fueling Facility will employ Stage II vapor recovery devices

#### 14. Noise

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on noise.*

A Noise Assessment Report was prepared by the Applicant's consultant (TRC Engineers, Inc.), measuring existing ambient noise levels at nine locations surrounding the Site, including the closest residential streets. Current ambient noise levels at these monitoring locations were found to be typical for suburban settings with major roadways nearby.

The Noise Assessment Report also calculated the potential increase in ambient noise levels from (a) Costco's HVAC equipment, (b) delivery trucks, and (c) increased traffic associated with the Proposed Action. Noise generated by HVAC equipment is projected to increase existing background noise by 0-1 dBA, depending on the location. Noise generated by delivery trucks is projected to increase existing background levels by 0-2 dBA, depending on the location. Noise generated by increased traffic is projected to increase background levels by 0-1.2 dBA, depending on the location. An increase of 3 dBA or less is generally considered to be barely perceptible, and an increase of 6 dBA or less is generally considered to be non-significant under NYSDEC's guidance on Assessing and Measuring Noise Impacts. Since the individual and combined impacts of these sources are below the NYSDEC noise impact criterion, they will not result in any potentially significant noise impacts.

Construction activities, which may include rock crushing, drilling and blasting, will result in temporary noise impacts, which were also evaluated in the Noise Impact Report. Such impacts are typical for construction activities and will be limited to the hours prescribed in the Yorktown noise ordinance. Functional mufflers will also be installed and maintained on all construction equipment to reduce any noise impacts.



### **Mitigation and Improvements for Impacts Related to Noise**

- a. Blasting plan
- b. Installation and maintenance of functional mufflers on all construction equipment

### **15. Building Demolition and Construction**

*The Planning Board finds that the building demolition and construction of the Proposed Action will not give rise to any significant adverse impact.*

Construction of the Proposed Action will take approximately 15 months, beginning with Site preparation and the installation of sediment barriers and construction fencing. Prior to the initiation of construction, the placement of the sediment barriers upland from Wetland A will be inspected by Town and/or NYCDEP staff to confirm proper installation.

Following the implementation of these measures, demolition of existing facilities and infrastructure will occur, including the removal and off-site disposal of contaminated soil, aboveground and underground storage tanks, and underground septic systems. These demolition and remediation activities will be governed by an approved Environmental Health and Safety Plan/Community Air Monitoring Program ("EHASP/CAMP"), prepared in accordance with regulatory guidelines. Demolition of any buildings containing lead-based paint, asbestos, or any other hazardous materials, will be conducted in accordance with EPA, state, and local regulations to minimize the potential release of lead-containing dust.

Following demolition, the Site will be cleared and graded pursuant to requirements of an approved SWPPP and the standards in NYSDEC's New York State Standards and Specifications for Erosion Control. Sediment basins will be constructed during the grading of the Site to trap sediment and regulate stormwater runoff. After grading, the construction of the building pad, roads, parking areas and utility infrastructure will proceed, followed by construction of the Costco building itself.

Construction is expected to require 113,000 cubic yards of material excavation, including approximately 22,000 cubic yards of rock. Excavated earth and rock materials will be placed and compacted in fill areas, eliminating the need for prolonged stockpiling.

Engineered structural fill will be generated from onsite rock crushing operations. Should there be insufficient rock from excavation, structural fill may need to be imported. Unsuitable material that may be encountered will be exported. Any rock blasting required for construction will be undertaken pursuant to a blasting plan approved by the Town's Building Inspector as part of the Building Permit process. A detailed construction phasing plan is provided in FEIS Appendix J.

Construction activities will generate traffic associated with contractors and equipment and material deliveries, as well as truck trips associated with the removal of debris and demolition material, removal of excavated material and delivery of fill (if necessary). These vehicles and trucks will primarily access the Site from the Route 202/35 corridor. The Applicant has stated that it is not anticipated to result in any significant traffic impacts. The construction of off-site road improvements also has the potential to affect traffic patterns; such impacts will be regulated by a NYSDOT approved Maintenance and Protection of Traffic Plan and will be further reviewed and approved by the Planning Board during the site plan review process.

Potential impacts relating to construction are further discussed in sections of this Findings Statement addressing Soil, Noise, Air Quality and Hazardous Materials.

#### ***Mitigation and Improvements for Impacts Related to Construction***

- a. Construction phasing plan which shows that the construction will be phased and sequenced to protect Wetland A
- b. Neither MgCl nor hydrofracking brine will be used as a dust suppressant
- c. Consideration of additional measures to address proximity of proposed staging areas to Route 202
- d. Compliance with the latest edition of the Manual for Uniform Traffic Control Devices ("MUTCD") and provide one or more onsite trained personnel to oversee and direct ingress and egress and control the flow of traffic in and out of the site so as to ensure and maintain safety and minimize impact to neighborhood residents
- e. Prior to the initiation of construction, the placement of the sediment barriers upland from Wetland A to be inspected by Town and/or NYCDEP staff to confirm proper installation



- f. See also related improvements and mitigations listed in *Sections D. 3 (Soils), 4 (Hazardous Materials), 13 (Air Quality) and 14 (Noise)*

## **16. Community Facilities and Services**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on community facilities and services.*

Not including Special District taxes, the Proposed Action is projected to generate \$797,195 in annual property taxes, a net increase of \$686,706 over existing taxes paid for the Site. An additional \$135,902 of the Proposed Action's tax revenues (\$92,902 Town tax, \$41,148 Lake Mohegan Fire District and \$2,506 Advanced Life Support Special District taxes) could be available to support local police, fire, and emergency services, depending on Town Board budget. The demand created by the Proposed Action is expected to result in approximately 106 annual calls to the Yorktown Police Department, or an average of two calls per week. Costco will also employ its own security staff on Site, reducing the need for police involvement.

As described in the Traffic Section of this Findings Statement, the proposed addition of eastbound and westbound turn lanes and an additional westbound through lane on Route 202/35 will improve traffic flow compared to existing and no build conditions, which are currently inhibiting the access of police, fire, and emergency response vehicles to the Site and the surrounding area.

### ***Mitigation and Improvements for Impacts Related to Community Facilities***

- a. The Applicant will be required to employ its own security staff on Site, reducing the need for police involvement
- b. The Applicant will be required to provide eastbound and westbound turn lanes and an additional westbound through lane on Route 202/35, to improve access of police, fire, and emergency response vehicles to the Site and the surrounding area

## **17. Fiscal and Socioeconomic Impacts**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on fiscal and socioeconomic conditions or community character.*

Not including Special District taxes, the Proposed Action is projected to generate \$797,195 in annual property taxes, a net increase of \$686,706 over existing taxes paid for

the Site, including an estimated net gain of \$535,680 for the Yorktown Central School District, \$75,824 for the Town of Yorktown, and \$75,202 for Westchester County. Additionally, the Proposed Action will generate \$113,608 annually in Special District taxes for the Lake Mohegan Fire, Westchester County Refuse, Hunter Brook Sewer, Open Space and Conservation, Advanced Life Support and Yorktown Consolidated Water Districts. The Applicant has stated that it does not intend to apply for any tax exemption or a Payment In Lieu of Taxes (PILOT), or Industrial Development Authority (IDA) financing which would forgive sales taxes on construction materials, among other benefits. See Table below.

**Property Tax Revenues**

	<b>Town of Yorktown</b>	<b>Westchester County</b>	<b>School District</b>	<b>Sub-Total</b>	<b>Special District*</b>	<b>Total</b>
Current (unimproved)	\$16,424	\$16,455	\$77,610	\$110,489	--	\$110,489
Projected (Costco)	\$92,248	\$91,657	\$613,290	<b>\$797,195</b>	\$113,608	\$910,803
<b>NET</b>	<b>\$75,824</b>	<b>\$75,202</b>	<b>\$535,680</b>	<b>\$686,706</b>	\$113,608	\$800,314

\* Special District taxes for the Lake Mohegan Fire, Westchester County Refuse, Hunter Brook Sewer, Open Space and Conservation, Advanced Life Support and Yorktown Consolidated Water Districts.

Construction of the Proposed Action will increase economic activity within Yorktown, resulting in approximately \$553,125 in sales tax revenues and approximately 350 full time equivalent construction jobs. Once fully operational, the Proposed Action will create approximately 200 permanent jobs, which are expected to be relatively evenly divided between full time and part time workers. Costco pays an average hourly wage of \$19.43 for full time warehouse employees<sup>7</sup>, with benefits available after 90 days of employment for full time employees and after six months for part time employees.

Based on information in the EIS from other Costco locations, the Yorktown Costco would not cause any loss, and certainly no significant loss, in property values. Further, the Planning Board recognizes that the Town Board decision to retain zoning for the Site to allow for a regional retail draw anticipated that there would not be such a negative effect.

<sup>7</sup> Does not include salaried managers or their salaries.



A Commercial Character Assessment (prepared by Applicant's consultant and updated for the FEIS) analyzed the Proposed Action's potential impacts on nine categories of "relevant retailers" within the Five Hamlet Study Area (covering Yorktown Heights, Mohegan Lake, Shrub Oak, Jefferson Valley and Crompond) whose goods or services overlap with those provided at Costco. The study inventoried 198 retail establishments in this area, of which 95 were found to be "relevant retail" establishments that carry some or all of Costco's product line and thus would be potentially affected by locating a Costco at the Site (most of these establishments attract shoppers on a convenience-oriented basis rather than a destination-oriented basis). The Commercial Character Assessment concluded that while Costco would likely compete, to some extent, with nearby retailers, it will not result in any significant adverse impacts to the community or commercial character of the Yorktown Five Hamlet Study Area.

The FEIS also considered the potential impact of the Costco on the BJs located on Route 202. While the Project might intercept some sales from that BJs, that effect will not be significant, as there are numerous locations in the Tri-State area in which BJs and Costco stores co-exist in proximity. The Planning Board notes that while the addition of any commercial establishment has the potential to increase competition for existing businesses (such as existing gas stations), purely economic impacts that do not result in adverse community character impacts are not environmental impacts subject to SEQRA.

#### ***Mitigation and Improvements for Socioeconomic Impacts***

- a. The Applicant has stated that it does not intend to apply for any tax exemption or a Payment In Lieu of Taxes (PILOT), or Industrial Development Authority (IDA) financing which would forgive sales taxes on construction materials, among other benefits
- b. No liquor pod on the Site

#### **18. Historical and Archeological Resources**

*The Planning Board finds that the Proposed Action will not have a significant adverse impact on historical and archeological resources.*

The Site does not contain any structures listed or eligible for inclusion on the State or National Registers of Historic Places ("S/NRHP"). The primary cultural and architectural impacts from the Proposed Action will, therefore, consist of visual impacts from the TSP (a scenic byway listed on the S/NRHP), FDR Park and 2358 Old Crompond Road (which was included in the Town of Yorktown historical structures survey). As described in the Visual Impacts section of the FEIS, the abandoned and deteriorated structures on the Site are currently visible from both the TSP and FDR Park. Development of the Proposed Action will provide landscaping designed to preserve the TSP and FDR Park viewsheds and shield views of the Costco building and fueling facility. A minimum of 150 feet of existing woodland will be maintained along the western side of the site to screen the proposed development from 2358 Old Crompond Road (the nearest residence on Old Crompond Road) and new plantings along the proposed retaining wall and embankment will further reduce visual impacts from the Site's western neighbors.

The Site currently contains two residential dwellings, Zino's Nursery and Landscaping, Anthony's Power Equipment (a former dwelling) a former workshop now used as an office, a large barn, a vacant motel complex, and a former gate and fence supplier (formerly a gas station). The former dwelling on Site (now used for power equipment repair) is believed to have been constructed as a farmhouse in the mid-nineteenth century, and the former workshop (now used as an office) may also date back to the nineteenth century farmstead. The remainder of the Site was developed in the mid-twentieth century.

A Cultural Resources Report documenting architectural and viewshed impacts of the Proposed Action was submitted to the NYSOPRHP, which responded in a letter dated May 24, 2012 that "the project will not have any substantial negative impact upon historic resources: The proposed landscape buffer between the development and the National Register listed Taconic Parkway appears to mitigate most of the visual incompatibility that could otherwise attend the project." Therefore, the Planning Board finds that the Proposed Action will not result in any significant adverse archeological impacts.



***Mitigation and Improvements for Cultural/Historical Impacts***

- a. Installation and maintenance of a planting buffer in the NYS DOT right-of-way, including but not limited to the planting of approximately 100 evergreen trees
- b. The Planning Board will consider the relocation of the mid-1800s farm house to Town or State parkland and the restoration of same
- c. The Planning Board will consider a program to remove invasive species along the FDR park/Taconic State Parkway corridor

**19. Induced Growth**

*The Planning Board finds that the Proposed Action will not create any significant adverse impact with respect to induced growth.*

Potential growth along Old Crompond Road may occur, in part as a result of the extension of the proposed sanitary sewer and natural gas services along Old Crompond Road as well as the roadway improvements to Route 202/35. While numerous factors influence the location of new development, and no development applications for the parcels surrounding the Proposed Action have been approved as of this date, the FEIS analyzes the potential impacts of future development on parcels connected to the sewer and natural gas extension. The assumed development includes:

- Residential Properties (28.18.1-9 through 1-16), currently zoned for single family residential use and developed with residential dwellings, which were assumed to be developed as multi-family residential in the FEIS and a combination of multi-family residential and office/commercial space in a post-FEIS Technical Memorandum from Maser Consulting, P.A., the Applicant's traffic consultant, dated August 26, 2014.
- 3-Acre Commercial Lot (16.18-1-20), currently vacant and zoned for commercial use, which was assumed to be developed as a 10,000 square foot commercial development.
- 12-Acre Commercial Lot (36.06-2-72), currently vacant and located within a planned interchange zone, which was assumed to be developed with a 330-seat temple, as requested in a prior application.

The timing and scope of development on these lots is uncertain and any pending or future development applications will trigger separate SEQRA review processes where

specific impacts and mitigation measures can be assessed in greater detail. However, for the sake of discussion, if the foregoing development were to be considered induced by the Proposed Action, such development would not result in any significant adverse environment impacts.

Traffic from the potential development of these parcels is less than the traffic that would have been generated by a previously proposed Stop and Shop supermarket, which was proposed on the site located at the intersection of Stony Street and 202/35 and Old Crompond Road. The latter development was included in both “Build” and “No Build” scenarios for the DEIS and FEIS traffic analysis but has since been withdrawn. Therefore, any potential “induced” traffic impacts associated with these lots have already been accounted for in the FEIS and DEIS analyses. These analyses indicate that such potential impacts would not be significant.

The potential development will consume approximately 40,200 gallons of water per day and produce approximately 36,500 gallons of sewage per day, which could be accommodated without significant impact to existing infrastructure. The proposed sewer extension for the Project has capacity to accommodate the proposed sewage flow from potential development. Any wetlands or steep slope disturbances will require permits from the Planning Board, and site-specific development impacts would be addressed through the site plan and permit approval process. Finally, the potential development is projected to generate approximately \$1,117,765 in property taxes (FEIS Table VI.1c), offsetting potential impacts to community services and infrastructure. Therefore, in the event that extension of sewer service associated with the Proposed Action induces new development, such development would not result in currently foreseeable, potentially significant, adverse environmental impacts.<sup>8</sup>

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<sup>8</sup> Since the DEIS, a petition for rezoning of the land parcels (lots 26.18-1-11, 12, 14, 15, 16) was received by the Town Board. The petition proposes 96 age restricted residential units and 44,000 square feet of commercial space. The petition was received in July 2014 and is a discretionary approval by the Town Board. The proposal is highly speculative, but at 96 units of residential and 44,000 square feet of commercial space it is reasonable to expect that the impacts associated with the proposal would be no greater than those which were studied in the DEIS, as set forth in a Technical Memorandum from Maser Consulting, P.A., dated August 26, 2014.



## **E. Alternatives**

*The Planning Board finds that the FEIS considers a reasonable range of alternatives.*

The following alternatives (including variations thereof) were developed and compared with the Proposed Action for relevant areas of impact.

### ***Alternative A. No Build***

The Alternative A (the No Build) is required by SEQRA to be discussed in the DEIS. The No Build Alternative assumes the Site would remain in its current state. The Property's current uses: two residences, Zino's nursery, the former King Gates & Fences (formerly a gas station) and the abandoned motel, would remain. There would be no demolition of abandoned buildings on the Site, and views of those buildings would continue.

The No Build Alternative would not impact or increase land disturbance, traffic generation, or air quality. The Applicant would not take ownership of the land and would have no responsibility under the No Build Alternative to remediate the existing contaminated soil or improve the deteriorated conditions of the Site and, therefore, there would be no immediate schedule to remediate the Site. Any cleanup of the contamination would remain the responsibilities of the current owners.

Stormwater would continue to be untreated, which would allow contaminants from the Site to continue to be transported downstream. Under the No Build Alternative, there would be continued use of on-site septic, which would pose a continuing threat to groundwater quality, rather than the Project's plans for a sanitary sewer that would eliminate that threat as well as provide sewer to the adjoining area. The operation of the nursery, fence company, residences and hotel uses would entail substantially greater water usage of approximately 9,200 gallons per day, as compared to the expected water use of the Proposed Action of approximately 5,500 gallons per day. Under the No Build Alternative, there would be no extension of water or gas mains, which would service adjoining properties as well as the Site. The Applicant-sponsored improvements to the road network in the vicinity of the Site would not be undertaken, and thus improved traffic flow would not be achieved. The No Build Alternative provides no expansion of

the variety of consumer goods available to area residents and no increase in property tax revenues to the Town of approximately \$797,195 per year (excluding Special Districts), most of which would go to the School District.

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***Alternative B. The Proposed Action With the Building Sited Further West on the Property, Away From the Taconic State Parkway***

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Alternative B locates the building further west on the Site. The building size (151,092 s.f.) and parking spaces provided (610 spaces) are the same as the Proposed Action. The limit of disturbance is essentially the same, and the area of disturbance within the wetland buffers is the same. However, this alternative locates the building in the area of steep slopes requiring importing structural fill to be placed beneath nearly the entire building (approximately 80,000 cubic yards). Approximately 10,000 additional cubic yards of soil containing heavy metals would need to be exported and a higher retaining wall would be needed. By comparison, the Proposed Action locates the building further east, where much less structural fill will be required. As a result, Alternative B would generate more construction traffic to import structural fill material and export excess excavated Site material (approximately 35 trucks per day for 6 months).

Although the objective of including Alternative B was to reduce visual impacts from the TSP by locating the building to the west of the Site, further from the Parkway and higher on the Site, this is likely to make the building more visible from the Parkway as compared to the Proposed Action. The views of passing motorists would, as with the Proposed Action, be screened by proposed landscaping, but the higher the building, the less effective the screening. In addition, under Alternative B, the building would be nearer the Site's residential neighbors on Old Crompond Road, although its visibility would be obscured by the remaining existing woods and proposed supplemental landscaping. As previously noted in Section D.19 (Induced Growth), an application was recently submitted to the Town Board to rezone this area for commercial and multi-family residential use, which might alter the need for such a visual buffer.

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***Alternative C: Alternative Site Layouts that Avoid Direct Impacts to Wetland Buffer Areas***

Alternative C provides an alternative site layout intended to minimize impacts to the wetland buffer areas. In this alternative, the building would be shifted south and the loading area would be shifted to the northwest to avoid the Wetland B buffer area. The parking layout would also be rearranged to minimize impacts to the Wetland A buffer. Alternative C would provide insufficient parking on grade and necessitate a parking deck or basement parking to provide the remaining parking spaces. The Applicant has stated that these parking alternatives are not consistent with the store's suburban setting and are not feasible at the Site, for the following reasons:

- The parking alternatives would not have direct access to the building, and therefore would require customers to maneuver large shopping carts in elevators or drive to a designed pick-up location, increasing on-site traffic;
- The parking alternatives would require customers to maneuver large carts within confined spaces, contributing to safety concerns;
- A parking deck would require continuous illumination, increasing energy usage;
- A parking deck would cost approximately \$5.5 million, compared to \$750,000 for surface parking; and
- Basement parking would require the additional excavation of approximately 67,000 cubic yards of material, a large portion of which is rock that would need to be blasted, increasing the Project costs and environmental impacts.

For the foregoing reasons, these parking alternatives would not achieve the objectives of the Project Sponsor. The Planning Board finds that the benefits which could be achieved by Alternative C would be realized through the changes reflected in the FEIS Site Plan and post-FEIS enhancements which incorporate stormwater management improvements and other wetland protection measures, as hereinbefore described (such as construction of a retaining wall along the western perimeter of the parking lot to reduce impact to existing woodlands and wetland buffer; installation of an expanded infiltration system to enhance pollutant removal and thermal cooling of

stormwater prior to its introduction to the wetland buffer area and a more aggressive pre-treatment plan).

The potential to use a smaller Costco building to avoid the necessity for a parking deck was also considered; however, the Applicant has stated that Costco's smaller building model is only 3,000 square feet smaller than the Proposed Action and would not provide any meaningful environmental benefits. An alternative site plan illustrating an even smaller building of 120,000 s.f. supported by 600 at-grade parking spaces was also considered under Alternative C. This alternative would require the same area of land disturbance and generally similar environmental impacts as the alternative above, with lower levels of tax generation (approximately \$115,000 per year less than that generated by the Proposed Action, exclusive of special districts). Moreover, since the Applicant has stated that Costco requires a greater floor area than this alternative allows, this alternative does not fall within the objective and capabilities of the Project Sponsor.

However, if Alternative C were modified to reduce the parking requirements based on the recent Town legislation, which reduced parking requirements to 4 parking space per 1,000 square feet, this would reduce the number of required parking spaces to 480, and would free up an additional 1.5± acres of the Site. However, this would also create additional development opportunity on the Site for a free-standing retail or commercial building, such as a bank. Such additional development would effectively utilize most of the open space created by this revised alternative, and be comparable to the Proposed Action in terms of relevant areas of impact (e.g., traffic generation, stormwater, wetland impacts, etc.). However, if the newly-available open area would remain undeveloped, this would afford the opportunity to reduce the amount of impervious paving and resulting stormwater runoff, and move in the western edges of the parking area and thus reduce impacts to the Wetland A buffer. However, the Site Plan incorporates stormwater management improvements and other wetland protection measures, as hereinbefore described, which accomplish similar benefits to those associated with a reduced building and parking area. The smaller building would reduce views from the TSP, but landscaping would remain necessary to provide screening. This alternative, as noted above, would reduce revenues (exclusive of special districts) by approximately \$115,000 per year less than that generated by the Proposed Action. The



Project Sponsor/Applicant has stated that none of the Options under Alternative C fall within its objectives and capabilities.

***Alternative D: Commercial Center Employing a Group of Buildings Per Zoning, Including a Village-Like Development***

Alternative D provides a village-like development consisting of several buildings arranged throughout the Site. This mixed-use development includes a bank, restaurant and retail space, but no Costco. The building area for this alternative is 92,465 square feet, compared to the Proposed Action, which is 151,092 square feet. However, the land disturbance required for Alternative D would be similar to the Proposed Action because there would be a less efficient use of the land (i.e., building area per acre). Locating this type of development at the “top of the hill” in the Bear Mountain Triangle would be inconsistent with the Comprehensive Plan, which provides for village-like development type at the “bottom of the hill.”

As shown in DEIS Table IV.5, the traffic generated by Alternative D would be similar to the Proposed Action; traffic generation would be greater in the AM peak, similar in the PM peak, and slightly less for the Saturday peak (while the size of the development would be smaller, the traffic generation for mixed use development would be higher per square foot). The development costs for Alternative D would be similar to the Proposed Action but the lower building square footage would reduce project revenue and taxes paid to the various entities (a reduction of approximately \$310,000 per year, exclusive of special districts). Since land disturbance, onsite infrastructure, off-site utility infrastructure and highway improvements would remain similar to the Proposed Action; Alternative D would have similar environmental and physical impacts as compared to the Proposed Action. Alternative D would not meet the Project Sponsor’s objectives.

***Alternative E: Hotel or Motel Development***

Alternative E provides a mixed-use development in which a hotel is the central component. The development includes a 3-story, 136-room hotel supported by three standalone retail stores, a bank and two restaurants. When compared to the Proposed Action, the building area for this alternative is 133,209 square feet versus 151,092 square

feet. However, the land disturbance required for Alternative E would be similar to the Proposed Action because, as noted above, there would be less efficient use of land with multiple buildings and parking would need to be situated throughout the Site to serve the individual buildings.

As shown in DEIS Table IV.5, traffic generation for Alternative E would be similar to the Proposed Action; traffic generation would be greater in the AM peak, similar in the PM peak, and slightly less for the Saturday peak (while the size of the development would be less, the traffic generation would be higher per square foot). Therefore, the required traffic improvements would be similar as well. Since land disturbance, onsite infrastructure, off-site utility infrastructure and highway improvements would remain similar, the development costs and environmental impacts would also be similar to the Proposed Action. However, several areas of impact would likely be greater as compared to the Proposed Action. The hotel would likely entail additional landscaping to soften the view from Route 202. Additional landscaping would require more water and fertilizer usage than the Proposed Action. Fertilizer usage, even when controlled, adds nitrogen and phosphorous to stormwater, which could trigger the need for treatment beyond that provided for the Proposed Action. A hotel would also generate greater sewage than the Proposed Action, which would therefore use greater capacity of the system. Under Alternative E, project revenues and the smaller building area would reduce the taxes paid by about \$95,000 per annum (excluding special districts).

The DEIS also considered another layout for Alternative E, limited to a single Hotel/Motel and freestanding restaurant. Neither of these layouts for Alternative E would meet the Project Sponsor's objectives for the Proposed Action.

### ***Costco Store Without Fueling Facility***

Finally, in response to the DEIS, a number of commenters requested the additional consideration of a Costco store without a fueling facility. This alternative was not required by the Final Scope, and it would not meet the Project Sponsor's objectives, which have always included a fueling facility as part of the Proposed Action. As explained herein, the Planning Board finds that the fueling facility will not cause any significant impacts relating to hazardous substances. The Planning Board also finds that



stormwater runoff from the fueling facility will not cause significant stormwater runoff impacts because stormwater will be captured and treated in perimeter sand filter systems and then conveyed to the on-Site subsurface infiltration system.

The Planning Board also finds that the fueling facility will not generate significant adverse traffic impacts because a high percentage of the anticipated trips to the fueling facility are “dual-purpose” trips that also include a trip to the Costco store; the studies conducted at other Costco stores indicate that no more than 90 additional trips during the peak periods are attributable to the fueling facility. The sensitivity analysis conducted for the traffic impact study, and noted above, reflects that even assuming a higher generation of traffic attributed to the fueling facility, such traffic would be adequately accommodated by the NYSDOT-completed and Applicant sponsored roadway improvements. Further, the elimination of the fueling facility would not provide the opportunity to shift the Costco building south toward the Route 202 due to the NYSDOT requirement that the entry road be located across from Mohansic Avenue to form a full four-way intersection. The access road from that point has to negotiate the grade differential to the parking lot elevation requiring the length and configuration shown on the site plan. Therefore the area occupied by the fueling station would only be available for parking stalls, and would not offer significant reduction or relocation of any pavement or structures that would reduce any wetland buffer encroachment elsewhere on the site as presently proposed.

The elimination of the fueling facility, therefore, would not significantly reduce the Proposed Action’s environmental impacts, but would result in a reduction of annual property tax generation.

#### **F. Improvements of and Mitigation Measures for the Proposed Action**

The Proposed Action includes a number of measures that are part of the development, and will be included as such in the Project Sponsor’s application for site plan approval (and/or, as appropriate, other permits and approvals). In addition, the Project Sponsor has proposed a number of mitigation measures, which have been adopted by the Planning Board in this Findings Statement. The Planning Board has also included certain

additional mitigation measures, noted in this Findings Statement (some of which will further reduce non-significant impacts), which will be included as conditions in appropriate future approvals (most particularly, any site plan approval) of the Proposed Action. In many cases, these measures will be refined during the site plan approval process. These collective measures, regardless of nomenclature of mitigation or Project elements, are identified hereinabove and in Appendix A attached hereto.

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#### **G. Conclusions:**

The Planning Board finds and certifies that:

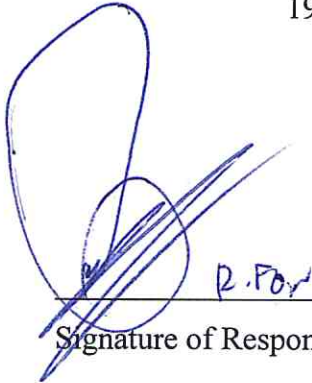
- The Planning Board has given due consideration to the Draft and Final EIS, and information derived from other documents and public hearings and Planning Board meetings during the course of this SEQRA review process;
- This Findings Statement has been prepared pursuant to and as required by 6 NYCRR Part 617;
- Consistent with social, economic and other essential considerations from among the reasonable alternatives available, the Proposed Action is one that avoids or minimizes adverse environmental impacts to the maximum extent practicable, and that adverse environmental impacts will be avoided or minimized to the maximum extent practicable by incorporating as conditions to the decision those mitigative measures that were identified as practicable.



**Town of Yorktown Planning Board**

1974 Commerce Street, Yorktown Heights, NY 10598

Telephone: (914) 962-6565



R. Fow

Signature of Responsible Official

RICHARD C. FOW

Name of Responsible Official

CHAIR PLANNING BLD.

Title of Responsible Official

12.15.14

Date

## **Appendix A**

### **Yorktown Planning Board Findings Statement for the Costco Wholesale Store and Fueling Facility**

#### **Traffic Related Improvements**

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Based on the results of the capacity analyses contained in the Revised Traffic Impact Study of the FEIS, the following is a summary of the recommended traffic related improvements for the Proposed Action. Subject to approval by relevant authorities including NYSDOT, the Applicant will fund and implement the following specific measures, which may be enhanced and/or fine-tuned during the site plan review process:

1. The Applicant will construct an additional westbound through/right turn lane on Route 35/202 through the TSP interchange area between Strang Boulevard, past the site driveways, to Old Crompond Road to complement the previously completed NYSDOT improvements. This improvement will reduce existing westbound delays through this area and accommodate the Costco generated traffic (See FEIS Site Plan Introductory Exhibit 5).
2. The Applicant will construct a new eastbound left turn storage lane for left turn movements from Route 202/35 onto the TSP northbound ramp. This lane will begin prior to the TSP southbound ramp intersection resulting in a left turn storage area of approximately 360 ft. which is a significant increase over the existing approximately 100 ft. eastbound left turn storage lane. This new lane will allow for vehicles destined to the Taconic State Parkway northbound to queue without impeding the eastbound traffic continuing through the interchange area. In addition, this improvement will also result in the length of the westbound left turn lane increasing from approximately 100 ft. to 330 ft. (See FEIS Site Plan Introductory Exhibit 5).
3. Associated with the access driveway for the Proposed Action, the Applicant will construct a separate eastbound left turn lane on Route 35/202 for traffic entering



the site and the site driveway approach (southbound approach) will be constructed to consist of two full lanes in the form of a separate left turn lane and a shared separate left/through/right turn lane. In addition, the Mohansic Avenue northbound approach will be widened to two lanes in the form of a separate left turn lane and a shared through/right turn lane (See FEIS Site Plan Introductory Exhibit 5). Corresponding signal improvements, including pedestrian signals, will be required to accommodate the new intersection geometrics. These improvements will be coordinated with NYSDOT and will be completed by the Applicant as part of the Highway Work Permit process.

4. The Site will also be accessed via a separate right turn entry and exit driveway to west of the main entry driveway. The existing sight distances at this intersection are approximately 650 ft. looking to the left and 545 feet looking to the right. Based on AASHTO a stopping sight distance of 305 ft. and an intersection sight distance 445 ft. is recommended for a speed limit of 40 MPH. These minimum AASHTO site distances will be met and maintained for this intersection.
5. The traffic signals along NYS Route 35/U.S. Route 202 in the interchange area will also be modified to accommodate the new intersection geometrics and signal timing adjustments will be made to help alleviate existing vehicle queues. The modified/new traffic signals will be installed by the Applicant at the following intersections:

- NYS Route 35/U.S. Route 202 & Strang Boulevard
- NYS Route 35/U.S. Route 202 & Taconic State Parkway NB Ramps
- NYS Route 35/U.S. Route 202 & Taconic State Parkway SB Ramps
- NYS Route 35/U.S. Route 202 & Mohansic Avenue/Costco Site Access

These improvements have been coordinated with NYSDOT and will be completed by the Applicant as part of the Highway Work Permit process.

6. The Applicant will construct a new sidewalk on the north side of Route 35 202 between Strang Boulevard and Old Crompond Road consistent with the recommendations of the Town of Yorktown Comprehensive Plan (Policy 3-20) and the Sustainable Development Study (Chapter V.C.4: Pedestrian and Bicycle Considerations). This sidewalk will connect to the recently completed sidewalk constructed as part of the NYSDOT project, which will provide a continuous sidewalk system along Route 35/ 202 between Old Crompond Road and the Parkside Corners Shopping Center. (See FEIS Site Plan Introductory Exhibit 5).
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The Applicant's improvements will also include crosswalks and pedestrian signals, including countdown modules at each of the four intersections. At the Strang Boulevard intersection a crosswalk with pedestrian signals will be provided crossing the eastbound approach to provide safe and convenient access to both FDR State Park and to the Westchester County bus stop location on the south side of NYS Route 35/U.S. Route 202 at this intersection. Crosswalks with pedestrian signals will be included crossing both the Taconic State Parkway northbound entry ramp and the southbound exit ramp. Finally, crosswalks and pedestrian signals will be provided on all approaches to the Mohansic Avenue/Site Access intersection. The sidewalk along Route 35/202 will connect to a sidewalk along the east side of the main access driveway that will continue into the site and connect to the proposed sidewalk along the south side of the proposed building and will lead pedestrians to the main access of the store (See FEIS Site Plan Introductory Exhibit 5).

7. The Applicant's improvements will include the construction of a minimum shoulder width of 5 ft. in each direction along Route 35/ Route 202 through the Taconic State Parkway Interchange area to accommodate bicycles as per Section 17.4.1 (Bicycle Facilities Design Policy) of the NYSDOT Highway Design Manual, which states that the needs of bicyclists can be met through the use of wide curb lanes, bike lanes and/or paved shoulders of adequate width. This will complement the recently completed NYSDOT improvements, which also



provided a shoulder in each direction along NYS Route 35/U.S. Route 202 from Old Crompond Road to the project limits near the existing Snap Fitness.

8. The Applicant's improvements will include the construction of a new bus stop on the north side of the intersection of NYS Route 35/U.S. Route 202 and Strang Boulevard to replace the existing substandard bus stop.
9. The operation of the following existing signalized intersections will be improved for future No-Build and future Build Traffic Conditions by minor signal phasing/timing changes as specified in the Synchro Analysis contained in the Revised Traffic Impact Study.
  - NYS Route 35/U.S. Route 202 & Lexington Avenue
  - NYS Route 35/U.S. Route 202 & NYS Route 132
  - NYS Route 35/U.S. Route 202 & Springhurst Street/High School
  - NYS Route 35/U.S. Route 202 & Granite Springs Road/Middle School
  - NYS Route 35/U.S. Route 202 & Baldwin Road
  - NYS Route 35/U.S. Route 202 & NYS Route 118/Commerce Street

These traffic signal timing improvements will be coordinated with NYSDOT by the Applicant as part of the Highway Work Permit process.

**Appendix B**  
**Comments and Responses on the FEIS**

The following comments on the FEIS were received by the Planning Board:

1. Letter from Richard E. Stanton, Esq., Law Offices of Richard E. Stanton, dated October 31, 2014.
2. Letter from Andrew Willingham, P.E., Willingham Engineering, dated September 19, 2014.
3. Letter from James Bryan Bacon, Esq., dated October 31, 2014.
4. Letter from Henry Steeneck, dated October 30, 2014.
5. Letter from Paul Moskowitz, dated October 27, 2014.
6. Letter from Patricia Johnson, received on October 31, 2014.
7. Letter from Dale Saltzman, received November 13, 2014.
8. Memo from the Town of Yorktown Advisory Board on Architecture & Community Appearance (ABACA), dated November 24, 2014.
9. Letter from the New York City Department of Environmental Protection, dated November 13, 2014.
10. Letter from Michael Maris, dated October 31, 2014.
11. Letter from Michael Maris, dated September 29, 2014.
12. Comments from Philip Bein, Charles Silver, Ph.D., Watershed Inspector General (WIG), including a technical appendix by Don W. Lake, Jr., P.E., CPESC, CPSWQ, dated October 31, 2014.
13. Letter from Greg Kravstov, dated December 3, 2014.

The following responses to FEIS comments were received by the Planning Board:

1. Post-FEIS Technical Memorandum from Maser Consulting, P.A., dated August 26, 2014.
2. Letter from Mark A. Chertok, Esq., Sive Paget & Riesel, P.C., dated November 21, 2014.
3. Letter from Philip J. Grealy, Ph.D., P.E., Maser Consulting, P.A., dated November 17, 2014.
4. Memo from Nickitas Panayotou, TRC Engineers, Inc., dated December 5, 2014.
5. Letter from Nickitas F. Panayotou, P.E. and Christopher S. Hanzlik, EIT, CPESC, CPSWQ, TRC Engineers, Inc., dated December 5, 2014, including appendices A, B, C, D and Figure 1.
6. Email from Philip Bein to Michael Bogin and John Tegeder dated December 15, 2014 regarding the Response to WIG Comments on the Costco Project.



**Appendix C**

**Letter from Nickitas F. Panayotou, P.E. and Christopher S. Hanzlik, EIT, CPESC, CPSWQ, TRC Engineers, Inc., dated December 5, 2014 including Appendices A, B, C & D and Figure 1; and**



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TOWN OF YORKTOWN

December 5, 2014

Mr. John Tegeder, R.A.,  
Director of Planning  
Town of Yorktown Planning Board  
Yorktown Community & Cultural Center  
1974 Commerce Street  
Yorktown Heights, NY 10598

Re: Costco Wholesale Store & Fueling Facility  
Yorktown, New York

Dear Mr. Tegeder and Members of the Planning Board:

On behalf of Retail Stores Construction Co. (the "Applicant"), we submit this letter in response to comments submitted by the Office of the Watershed Inspector General ("WIG") and the New York City Department of Environmental Protection ("NYCDEP") on the Final Environmental Impact Statement ("FEIS") for the proposed Costco Wholesale Store and Fueling Facility in the Town of Yorktown (the "Proposed Action"). Copies of the WIG and NYCDEP comments are included in Appendix A of this letter for ease of reference. As a preface, the Applicant notes that NYCDEP approval will be required for the Proposed Action's Stormwater Pollution Prevention Plan ("SWPPP"), and that NYCDEP will therefore continue to be involved with the permitting of the Proposed Action's stormwater management system. The Applicant anticipates that the WIG will also be involved in that permitting process.

A. **Responses to the Watershed Inspector General**

The WIG comments – which included a Technical Appendix by Donald W. Lake, P.E. – relate to the stormwater infiltration system and pollutant loading calculations in the FEIS. In particular, the WIG asserts that the runoff from the subsurface infiltration system through the existing subsoil profile will not provide a sufficient level of pollutant loading, because the tested infiltration rates at and around the infiltration practice exceed the 7.5 inch/hour "maximum design infiltration rate" stated in a prior version of the New York State Department of Environmental Conservation's Stormwater Management Design Manual.<sup>1</sup> The Applicant disagrees with this assessment. As stated in the FEIS, the Project was

<sup>1</sup> NYSDEC, Reducing the Impacts of Stormwater Runoff from New Development (1992).



designed in accordance with the operative, August 2010 Stormwater Management Design Manual (the "Manual"), which does not contain a maximum design infiltration rate. The Applicant also disagrees with the WIG's underlying premise that the infiltration practice and approximately 150 feet of soil media between the infiltration system and Wetland A will not provide any treatment or pollutant removal. In the FEIS, the Applicant conservatively took credit for only 18 feet of such media treatment; the Manual allows treatment credit for as little as three feet, based on meeting the design requirement for infiltration practices of providing a minimum of three feet of infiltrating soil above seasonally high groundwater or bedrock.<sup>2</sup>

However, in response to the WIG's comments, the Applicant has incorporated additional refinements to the Proposed Action's stormwater management system, adding an additional stormwater treatment practice that will pretreat and remove pollutants from runoff prior to entering the subsurface infiltration system. As described below, these refinements will result in a more environmentally protective project without any new or increased significant adverse impacts.

#### 1. Infiltration Practice and Pollutant Removals

During a joint meeting held between the Applicant's consultants, the WIG and NYCDEP on November 13, 2014, Donald Lake, the WIG's engineering/technical consultant, stated that proprietary stormwater treatment practices and technologies exist which are accepted for use by the NYSDEC based on third-party field testing and verification of the practice's performance by one of the following long-established storm water management practice evaluation systems: the State of Washington Technology Assessment Protocol - Ecology ("TAPE"), the Technology Acceptance Reciprocity Partnership Protocol ("TARP"), or the New Jersey Corporation for Advance Technology ("NJCAT").

Based on these discussions and further research to determine which practice could be best incorporated into the current design of the stormwater management system, the Applicant's engineering team selected the Jellyfish® Filter units manufactured by Contech Engineered Solutions LLC (Contech). Contech's technical staff has preliminarily determined for the Applicant's engineering team that seven (7) units would treat the 1-year post-development storm flow of 32 cubic feet/second.<sup>3</sup> The Jellyfish® Filter units are special manhole structures (see attached standard detail in Appendix B) that would be

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<sup>2</sup> The Applicant does not concur that merely because an infiltration rate exceeds the 7.5 inch/hour rate that absolutely no pollution reductions occur, and the WIG comments do not provide any independent support for this assertion.

<sup>3</sup> As set forth in the FEIS, the Applicant does not believe that any refinements to the stormwater management system are required to treat the 1-year storm, but has proposed an additional practice in order to address the WIG's concerns and result in an even more environmentally protective project.

strategically placed in-line with the storm drain pipe system to pretreat and remove pollutants from runoff prior to entering the subsurface infiltration system.

As shown in the January 2013 Washington State Department of Ecology document provided in Appendix B, the Jellyfish® Filter provides the following median pollutant removal efficiencies based on third-party field testing and monitoring that followed the TARP field test protocol:

- 89% Total Suspended Solids (TSS);
- 59% Total Phosphorus (TP);
- 51% Total Nitrogen (TN);
- 91% Biological Oxygen Demand (BOD);
- 90% Copper;
- 81% Lead;
- 70% Zinc, and;
- 62% Oil & Grease (O&G)

In addition, the Jellyfish® Filter received NJCAT verification in 2012 (also included in Appendix B). The Jellyfish® Filter will be used in series to pretreat stormwater before it is discharged to the Vortech® pretreatment units and the subsurface infiltration system that were already included in the FEIS.

Consistent with the WIG's Technical Appendix, the Applicant also calculated pollutant removal from the Vortech® pretreatment units. The following removal rates for the Vortech® units were taken from the 2012 International BMP Database for "Manufactured Devices - Physical and defined as gravitational settling with hydrodynamic devices," which is referenced in the WIG Technical Appendix:

- 11.6% Total Suspended Solids (TSS);
- 37% Total Phosphorus (TP);
- 7.9% Total Nitrogen (TN);
- 0% Biological Oxygen Demand (BOD);
- 8.5% Copper;
- 22.8% Lead;
- 23.4% Zinc, and;
- 65% Oil & Grease (O&G)

Using the above-verified pollutant removal efficiencies, the Applicant's engineering team has prepared an updated Pollutant Loading Analysis contained in Appendix C. The updated analysis shows that, using the Jellyfish® Filter, the Vortech® pretreatment units, and the infiltration and soil pollutant removal rates from the FEIS, the calculated post-development



loading for all stormwater pollutants is substantially less than that calculated for pre-development levels. Given the WIG's concerns about the high infiltration rates of the soils on site, the Applicant has also conducted an analysis assuming a 50% reduction in infiltration and soil pollutant removal rates from those in the FEIS. This analysis also shows the calculated post-development loading for all stormwater pollutants is substantially less than that calculated for pre-development levels. Finally, even if one were to assume no pollutant removal from the infiltration system and more than 100 feet of soil media, a position that the Applicant believes is not supported by science or the current NYSDEC regulations, pre-development loading of every stormwater pollutant is reduced aside from total nitrogen, which would increase by less than five percent.

Nitrogen is a key mineral nutrient controlling primary production in terrestrial ecosystems, oceans, and estuaries. Excess nitrogen compounds in stormwater runoff are usually converted into atmospheric nitrogen gas (N<sub>2</sub>) by denitrifying bacteria in freshwater systems without significant adverse impacts. Therefore, the slight (and unlikely) increase in total nitrogen (TN) loading is not anticipated to result in any significant impacts.<sup>4</sup>

Since nitrogen is no a limiting nutrient in freshwater ecosystems, this (extremely unlikely) increase is not anticipated to result in any significant adverse impacts.

Although not required by the WIG, in response to requests from Town staff the Applicant has also prepared updated Pollutant Loading Analyses for Wetland A, located on site, which are also contained in Appendix C. With the incorporation of the Jellyfish<sup>®</sup> Filter, the Vortech<sup>®</sup> pretreatment units, and infiltration with the associated soil pollutant removal rates set forth in the FEIS, calculated pollutant loading to Wetland A is significantly lower than under pre-development conditions. With the incorporation of the Jellyfish<sup>®</sup> Filter and a 50% reduction in infiltration and soil pollutant removal rates from those in the FEIS, calculated pollutant loading to Wetland A is lower than under pre-development conditions for all pollutants other nitrogen. For the reasons described above, this increase in nitrogen is not expected to result in any significant adverse impacts to Wetland A.

The subsurface infiltration system would still meet the Manual's runoff reduction volume RRv standing by providing 100% reduction of the water quality volume (WQv) from the 1-year storm as currently designed in the FEIS.

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<sup>4</sup> Schindler, David and Vallentyne, John R., Over fertilization of the World's Freshwaters and Estuaries, University of Alberta Press (2004).

2. NRCC Rainfall Data

The Applicant has agreed to the proposed (but not yet adopted) NRCC rainfall values and distributions, which vary from currently approved TP40 values in the Manual. Using the new values reduces rainfall amounts for the 1 and 2 year storms, but increases rainfall amounts for more intense storms (25-, 50- and 100-year), thus supporting refinements in design.

As part of Appendix D, there is a summary table comparing the project's peak discharge rates based on NRCC rainfall data against those with the currently in effect TP40 rainfall values used in the current design. The Appendix contains summary printouts of an amended hydraulic analysis which finds as follows:

- A. For the 1-year storm, the current design remains effective since the 1-year NRCC storm has slightly less volume than that previously calculated (114,560 c.f., or 2.63 ac. ft. vs. 126,325 c.f., or 2.90 ac. ft.). As stated above, the subsurface infiltration system as currently designed in the FEIS would still have more than sufficient capacity to provide 100% reduction of the WQv from the 1-year storm.
- B. However, additional storage of 28,000 cubic feet will be required to attenuate the post-development runoff rates to pre-development levels from the 50- and 100-year storm using the new NRCC rainfall values. The added storage requirement will be accounted by adding an underground storage chamber interconnected with the detention basin, as shown in Figure 1. Calculations in support of these findings are set forth in Appendix D.

3. Miscellaneous Additional Comments

The WIG Technical Appendix also contains miscellaneous comments (IV-2 through IV-5) requiring refinements to plans and details which the Applicant agrees with and will provide as part of Site Plan and SWPPP Approval.

The Applicant is in receipt of NYCDEP comment letter dated November 13, 2014 (included as part of Appendix A for ease of reference) and respond as noted in the following paragraphs:

B. Responses to the New York City Department of Environmental Protection

The following responses conform to the section numbering in DEP's comments:



1. Pollutant Loading

- A. The Applicant will incorporate the Jellyfish® Filter as an additional practice into the final design of the stormwater management system that will further pretreat and remove pollutants from runoff prior to entering the subsurface infiltration system (see further discussion in Item 1 of the WIG response). Thus, doing so will respond to the DEP's concerns with respect to the uncertainties of pollutant removal capabilities in the existing subsoils. (Refer to Response to WIG, Section A.1 above.)

In the last sentence of Comment 1A, NYCDEP expressed a concern about the adequacy of the depth to groundwater below the infiltration system. The Applicant notes that several test pits were taken and were witnessed by NYCDEP staff within the area of the infiltration practice (Test Pits BINF-5, 6, 11 and 12, see Appendix F of the FEIS SWPPP), all of which show that groundwater was not encountered. Furthermore, FEIS Exhibit III.G-A9 demonstrates that sufficient soil depths exist below the full footprint of the subsurface infiltration system.

Introductory Response III.G.5 of the FEIS states, "Based upon site-specific field investigation by the Applicant's geotechnical engineer, the soil to which the infiltration chamber discharges to is a well-drained sandy soil. Rock is located from 8 to 18 feet below the existing ground surface, and groundwater was not encountered (Test Pits BINF-6, BINF-12, Borings B-14 and B-115)." The above data demonstrates that there is more than adequate separation in the vertical soil profile to bedrock and groundwater. Thus, the Applicant contends that groundwater will not have any impact on the proposed infiltration practice.

- B. In response to the comment that the pollutant loading analysis is not conducted on a sub-drainage area basis, the Applicant refers to the following explanation from the Pollutant Loading report Executive Summary:

"The majority of runoff from the developed portions of the project (site and off-site) will be captured in the subsurface on-site infiltration system, while the remaining smaller portions will flow off-site without entering the infiltration system. Pollutant loadings that enter the on-site subsurface infiltration system will undergo on-site treatment reductions. A one-to-one quantitative comparison of existing and post development pollutant loadings at each of the Design Points (DP) is not necessary since the majority of the project's post development runoff under the 1-year, 24-hour storm will be redirected to the two "main" Design Points, DP-1 and DP-2. Therefore a qualitative comparison of existing and post development pollutant loading is given. Areas that currently drain directly to DP-1 and DP-2 have been reduced under the post development design. Runoff from post-development drainage areas tributary to DP-1 and DP-2 is captured in the on-site infiltration system. Runoff from DP-3 will continue to flow off-site as it currently does, but the post-development area

draining to DP-3 is reduced. The area that currently drains to DP-4 is largely being redirected to DP-2 and to the on-site infiltration system, with runoff from a smaller remaining area to be treated with an approved NYSDEC water quality practice before flowing off-site. Drainage from pre-development areas tributary to DP-5, DP-6 and DP-8 is being directed to DP-2 and to the on-site infiltration system under post-development conditions. DP-7 represents a small fringe area to the extreme east of the site with runoff that is not being captured in the on-site infiltration system. Runoff from new impervious surfaces tributary to DP-7 will be treated with an approved NYSDEC water quality practice before flowing off-site. Therefore the majority of runoff (DP-1, DP-2, majority of DP-4, DP-5, DP-6, DP-8) under post-development conditions will be treated by the on-site infiltration system, while a smaller portion from DP-4 and DP-7 will flow off-site subsequent to being treated with an approved water quality practice."

There is nothing in the Final Scope or the Manual that require pollutant loading analysis on a sub-drainage area basis. Since the vast majority of site drainage is being directed through the pre-treatment system and infiltration basin, that is the appropriate location for such analysis, and this, in fact, is location required by the town due to its relative proximity to Wetland A. The reductions in "fringe" drainage areas to DP-3, DP-4, DP-5, DP-6 and DP-8 under post-development conditions as discussed above will result in post-development pollutant loadings below pre-development levels at the Design Points.

- C. DEP's comment letter suggests that different drainage areas should be used for the Proposed Action's pollutant loading and hydrological analyses. There is nothing in DEP's regulations or the Manual that requires such an approach, and the Applicant believes that a consistent approach to the pollutant loading and hydrological analyses is appropriate. The Applicant notes that during the course of the design, several meetings were held with NYCDEP which formed the basis of selection of the pollutant loading method.<sup>5</sup>
- D. NYSDEC's Manual does not contain loading rates for fecal coliform analysis. Therefore, loading rates used for the fecal coliform analysis were taken from the New Jersey Department of Environmental Protection (NJDEP) Stormwater Management Technical Manual Appendix A document, "Special Water Resource Protection Area Requirements (Draft for Comment)," July 2010.
- E. The analysis was revised to include incorporation of the Jellyfish® Filter (Refer to Response to WIG, Section 1.A above).

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<sup>5</sup> The drainage areas can be further refined, to the extent necessary, during the NYCDEP permitting process.



- F. The referenced sewer extension along Old Crompond Road requires only excavation, backfill and re-surfacing of impervious area, as well as restoration of grassed shoulder areas. As such, the activity will not change either the hydrology or land cover/use (i.e. adding impervious area, change in vegetative cover from forest to grass/open space) of the area. As a result, no changes/increases in pollutant loads are anticipated.

2. Stormwater Practice Design

It is the Applicant's Engineer's opinion that the design of the subsurface infiltration system conforms to the required technical standards of the SPDES Construction Stormwater General Permit with specifics as follows:

- A. As set forth the infiltration system summary printout in Appendix D, the elevation of the overflow/surcharge pipes (shown in the HydroCAD printout as "primary outfall" as stated in the comment) for the subsurface infiltration system are set at or above the required elevation for containing the 1-year, 24-hour storm volume. As highlighted in the printout, the storage volume of the system at the overflow/surcharge pipe elevations (431.75) is 114,750 c.f., greater than the computed 1-year runoff volume of 114,560 c.f., or 2.63 ac. ft. (see WIG Response 2A above)
- B. Contrary to the NYCDEP's assertion that the stormwater practice is an infiltration trench (which is an at-grade practice to which surface runoff flows or is directed) the Applicant's Engineer has designed the practice as an "underground infiltration system" as defined under Chapter 10.4.3.3 of the Manual:

Several underground infiltration systems, including premanufactured pipes, vaults and modular structures, have been developed as alternatives to infiltration basins and trenches for space-limited sites and stormwater redevelopment applications. These systems are designed similar to infiltration basins or trenches, depending on site specific conditions, to capture, temporarily store and infiltrate the WQv within 48 hours. Underground infiltration systems are generally applicable to small development sites (typically less than 10 acres) and should be installed in areas that are easily accessible to maintenance.

In addition, the "Design Guidance" standards (where conformance is desired, but flexibility in design can be considered based on project-specific conditions) in Chapter 6.3.1 (Page 6-35) state that while the maximum contributing drainage area to an infiltration practice "should generally be less than five acres," the practice "can theoretically receive runoff from larger areas, provided that the soil is highly permeable (i.e. greater than 5.0 inches per hour)." As evidence of such flexibility, the practice summary table on Page 6-42 of the Manual states that an

infiltration practice may have a drainage area of 10 acres. Here, the field-verified infiltration rate, exceeding 5 inches per hour at the location of the infiltration practice, warrants such flexibility in design in terms of contributing drainage area to the practice

The underground infiltration system is located in an area that takes advantage of the excellent infiltration/percolation rates available and provides the required runoff reduction of the 1-year water quality storm, which is the primary goal of the current technical standards.

- C. The subsurface geotechnical data provided in the FEIS and SWPPP clearly shows that there is more than adequate separation in the vertical soil profile to bedrock (Refer to Response 1A above).
- D. Guidance was provided by the NYCDEP to the Applicant's engineer on the required number of test pits/infiltration tests by referring to the document "Frequently Asked Questions About Technical Requirements of the SPDES General Permit (GP-02-01) for Stormwater Discharges from Construction Activities, Version 2.0 - October 7, 2004." Response to Question 33 (Page 33 of the document) states:

"Appendix D Concept Design Testing requirements notwithstanding, DEC accepts as complying with the department's technical standards a minimum of one test pit/boring and one infiltration test for every 5000 square feet of basin area, with no fewer than four test pit/boring and infiltration tests per facility. The area should be divided to equal subareas, tests performed in the center of each sub-area..."

It is important to note that at the time the testing was done, a single chamber design for the subsurface infiltration system was being contemplated by the Applicant's engineer. Although the current design of the system consists of storage chambers acting in unison with the infiltration chamber, the testing performed is adequate based on the proposed infiltrating area of 2,250 s.f. Additional testing, if required by the NYCDEP, will be provided during the NYCDEP permitting process.

- E. See Response 1A and Item 1 of the WIG response above.
3. It is the Applicant's Engineer's opinion that there would be no significant adverse impact in variations in hydrology given the narrow band of existing wetlands, and presence of a flowing stream where the depths of flow will not vary substantially as a result of the change in hydrology. The Applicant would be amenable to the installation of test wells to monitor the hydrology of Wetland A. Given the depth of soils and percolation rates over this area, which were identified in the FEIS, the Applicant has concluded that mounding of infiltrated stormwater is highly unlikely. However, at DEP's request, as part



of the preparation of the final SWPPP (which must be approved by the Town and DEP) the Applicant intends to secure the services of Tectonic Engineering, the project's geotechnical consultant, to perform a mounding analysis to verify this conclusion.

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4. The Applicant notes that detailed testing of the soils for percolation along the proposed highway improvements (Appendix F of the FEIS SWPPP) found a lack of sufficient percolation for source control at other design points. In addition, lack of sufficient right-of-way was another factor, as well as the presence of topography with slopes greater than 15% which prohibited source control of runoff. Thus, the on-site solution was the only viable option in order to meet the requirements of the regulations. We note that travel time from the infiltration practice to the fringe of Wetland A exceeds three days.
5. The construction sequencing and erosion/sediment control plans require strict compliance with the maximum 5-acre threshold of disturbance. In establishing the phases in the sequencing shown, the Applicant's engineer specifically noted in Section 5.2 of the FEIS SWPPP that ESC (erosion and sediment control) measures, particularly temporary and/or permanent soil stabilization measures, shall be adjusted on a continual basis as earth-moving operations proceed from one phase/stage area to another. This allows the contractor flexibility to enter other phases for earthwork operations to secure cut and place fill where necessary while not exceeding the maximum 5-acre threshold.

Also as noted in Section 5.2 of the FEIS SWPPP, disturbance area values for the Project shown in the Preliminary Construction Schedule provided in the SWPPP and the FEIS represented the proposed maximum amount of soil disturbance/exposure that will occur for each month during the construction period. It is envisioned that the implementation and adjustment of ESC measures as discussed above should result in "actual" Project disturbance areas less than the maximums shown. Given the large area of building complex and other large areas of parking where stabilization can be applied in the form of granular subbase prior to proceeding with additional areas of disturbance, the Applicant's engineer believes that keeping under the 5-acre threshold as shown in the SWPPP and FEIS is realistic. This opinion is supported by discussions with prospective contractors during the preliminary bid process conducted by the Applicant.

The Applicant's engineer has taken note of the comments provided, and they can be addressed with more detailed information as part of Site Plan Approval and preparation of the final SWPPP which needs to be approved by the Town and NYCDEP.

6. Cut and fill calculations overall indicate an estimated excavation of approximately 119,000 cubic yards (cy) and a potential need between for 5,000

– 10,000 cy of imported material. Implementation and adjustment of ESC measures as discussed in Response No. 5 above would allow earth-moving operations to proceed from one phase/stage area to another so as not to have a need to stockpile excessive amounts of material.

7. Site and Grading Plans will be amended to show the flagged NYCDEP water course and 100-foot limiting distance, which is currently only shown on the Existing Conditions Plan (Drawing C-11). These amendments will be done as part of Site Plan Approval.
8. The Applicant's preliminary design of the alternate sewage disposal system is contained in Appendix I of the FEIS and describes the proposed treatment plant and subsurface disposal system. If the Applicant has to actually install the sewage treatment plant and subsurface disposal system, additional information will be provided consistent with the requirements of the NYCDEP.

Very truly yours,  
**TRC Engineers, Inc.**



Nickitas F. Panayotou, P.E.  
Principal, Land Development



Christopher S. Hanzlik, EIT, CPESC, CPSWQ  
Project Manager

cc: R. Steinberg  
L. Hochman  
A. Capellini  
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L. DeRosa  
B. Evans  
W. Breslin  
R. Rosenberg

NFP/bz  
Encs.



Attachments – Appendices

Appendix A

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Watershed Inspector General (WIG) Comments and Technical Appendix – October 31, 2014  
NYCDEP Comment Letter – November 13, 2014

Appendix B

Jellyfish® Filter Standard Detail  
January 2013 Washington State Department of Ecology (WSDE) document  
Jellyfish® Filter NJCAT verification

Appendix C

Tabular Results – Amended Pollutant Loading Computations by HDR

Appendix D

Peak Discharge Rates Comparison Table, NRCC (2011) vs. TP-40 Rainfall Data

HydroCAD Printouts:

NRCC Pre-Development Computation Summary, 1- through 100-Year Storm  
NRCC Post-Development Computation Summary, 1- through 100-Year Storm  
NRCC Post-Development 50- & 100-Year Pond Routings with Added Detention Storage  
NRCC Post-Development 1-Year Subsurface Infiltration System Summary

Figure 1 - Additional Flood Storage for NRCC 50 & 100 Year Post Development Storms



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### **Appendix A**

Watershed Inspector General (WIG) Comments and  
Technical Appendix – October 31, 2014  
NYCDEP Comment Letter – November 13, 2014



**From:** Charles Silver  
**To:** Robyn Steinberg; John Tegeder  
**Subject:** NYC Watershed Inspector General (WIG) Costco FEIS Comments 10-31-14  
**Date:** Friday, October 31, 2014 12:26:35 PM  
**Attachments:** WIG Costco FEIS Comments 10-31-14.pdf

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Robyn & John -

---

Attached are our comments concerning the Costco FEIS.

Please confirm that you have received this email. Thank you.

Charlie Silver

Charles Silver, Ph.D.  
NYS Office of the Attorney General  
Environmental Protection Bureau  
NYC Watershed Inspector General Scientist  
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Costco Wholesale Store and Fueling Facility  
Final Environmental Impact Statement

Crompond Road, Town of Yorktown  
Westchester County, New York

Comments of the Watershed Inspector General  
October 31, 2014

The Office of the Watershed Inspector General ("WIG" or "WIG Office") respectfully submits these comments to the Town of Yorktown Planning Board on the final environmental impact statement ("FEIS") concerning the proposed Costco Wholesale Store and Fueling Facility ("Costco" or "the Project"). This proposed commercial development would discharge into the drainage basin of New York City's New Croton Reservoir, the terminal reservoir of the City's Croton Watershed which can provide over one-third of the City's drinking water.<sup>1</sup>

WIG recognizes the new information provided in the FEIS, dated October 6, 2014, and appreciates the project sponsor's responses to many of our DEIS comments, which we submitted on December 19, 2012. The WIG Office submits these FEIS comments because it remains concerned about the potential water pollution impacts that the Project, in its current form, could have on the New Croton Reservoir and its drainage basin. The WIG Office does not oppose the Project. Rather, by these comments WIG seeks to ensure that the Project does not cause discharges of phosphorus and other pollutants carried in stormwater into the Reservoir's drainage basin, and to ensure compliance with the federal Clean Water Act and applicable New York water pollution laws.

As discussed in the Technical Appendix, the infiltration system proposed as part of the stormwater pollution prevention plan in the FEIS does not meet New York State design criteria for infiltration systems and will not achieve the pollution reductions claimed in that document. As a result, the entire hydraulic analysis of the Costco stormwater system needs to be re-calculated. In addition, once the hydraulic analysis of the Costco stormwater system has been revised, the project's sponsor needs to recalculate the phosphorus pollution loading section of the FEIS. As required by the Clean Water Act and Title 17 of the New York Environmental

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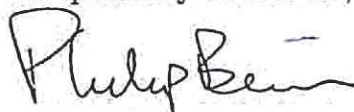
<sup>1</sup> WIG's authority was established by the New York City Watershed Memorandum of Agreement and implemented through successive Executive Orders of four governors, most recently pursuant to 9 NYCRR § 8.2. WIG was created by Executive Order 86 in 1998 "to enhance current efforts to protect the New York City drinking water supply from activities that have the potential to adversely affect the New York City Watershed reservoirs and tributaries." See 9 NYCRR §§ 5.86, 6.5, 8.2. WIG submits these draft comments pursuant to his responsibility under that Executive Order to "recommend legislative, regulatory and management practice changes . . . relating to the use, operation and protection of the Watershed." See 9 NYCRR §§ 5.86, 6.5, 8.2.



Conservation Law, if there is a net increase of phosphorus discharges from the site, the sponsor would have to perform or finance off-site stormwater retrofit projects to offset that increase. See WIG DEIS Comments, December 19, 2012, at p. 5. But the FEIS fails to present any proposed offsite mitigation measures that would offset the Project's increase in phosphorus loading or contribute to achieving the total maximum daily load for the New Croton Reservoir's watershed for phosphorus. A number of other technical comments, including the use of outdated rainfall data and the need for additional erosion and sediment control detail, also need to be addressed.

Accordingly, WIG respectfully requests that the Planning Board: (1) refrain from issuing findings approving the project under SEQRA at this time, (2) direct the project sponsor to prepare a revised FEIS or a draft supplemental environmental impact statement ("DSEIS") to address the shortcomings in the FEIS discussed in these comments, and (3) to make that document available for review by involved and interested agencies, including the WIG Office, and the public.

Respectfully submitted,



Philip Bein  
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Assistant Attorney General  
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## Technical Appendix

By Donald W. Lake, Jr., P.E., CPESC, CPSWQ  
October 31, 2014

The following comments are based on my review of the Costco FEIS, dated October 6, 2014, prepared by TRC Engineers, Inc.

### I. Infiltration Issues

Page 5 of Appendix E - Part 2, "Pollutant Loading Analysis for the Proposed Costco Yorktown Site" prepared by HDR and dated July 8, 2014, states that the existing soil will perform as a sand filter for additional pollutant removal below the infiltration stormwater management practice. It also states that the project assumes a 12 to 18 foot layer of this soil media to account for the additional treatment, even though it recognizes that there is an additional 100 feet of underground travel before the flow reaches Wetland A.

In addition, the designers have assigned their pollutant removal percentages based on Design 9, of the 1992 NYSDEC "Reducing the Impacts of Stormwater Runoff from New Development", shown in Chapter 6, Figure 15, page 90. This design credits a 60 to 80% removal for Total Phosphorous. This is based on their criteria stated on page 96, "General Design Criteria for Infiltration Practices": "b. Recognize that soils with an infiltration rate of less than 0.5 inches per hour are unsuitable for infiltration practices; similarly, the maximum design infiltration rate is 7.5 inches per hour." (emphasis added). The tested infiltration rates for the project at the practice location were 14.5 to 19.0 inches per hour, which is far in excess of the maximum criteria. Rapid flow through the soil will not allow for treatment and could be a direct conduit of pollutants to the surface water in Wetland A. Therefore, a bottom sand filter or restrictive membrane should be designed at



the infiltration boundary to limit the discharge rate to less than 7.5 inches per hour. It is noted that the sand filter permeability (k) factor listed in the New York State Stormwater Management Design Manual on page 6-52, is 3.5 feet per day, which equates to 1.75 inches per hour. The infiltration practice as designed will not provide the pollutant removal shown in the FEIS.

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Appendix E - Part 1, in its Appendix D, Post Developed Condition HydroCAD routings, page 4, shows the Infiltration System to have an outflow discharge of 0.76 cubic feet per second (cfs). Page 20, "Summary Sheet for Pond 1P: Infiltration", shows a direct entry of a constant discharge from the infiltration practice of 0.76 cfs. This is based on the low infiltration rate of 14.5 inches recorded during on-site testing (App. D, 3.5.F, on page 22). As noted above, this rate exceeds the allowable rate of 7.5 inches per hour for infiltration practices established by DEC. If the infiltration system is properly re-designed to meet this criteria, the outflow rate will be reduced to approximately 0.12 cfs, (for 7.5 in/hr), assuming a soil porosity of 30%. This is a reduction of 84% to the outflow and will dramatically change the water surface elevations in the system as designed.

Therefore, the entire hydraulic analysis of the Costco stormwater system should be re-calculated upon adjusting the infiltration system to meet NYS DEC Infiltration design criteria.

## II. Pollutant Loading Calculations

As noted in my Draft EIS Technical Appendix comments (Section IV. Pollutant Loadings: Absence of Water Quality Evaluation), the pollutant loading calculations in the FEIS were incomplete, since calculations for total phosphorus were omitted. Table A-2 in Attachment A to Appendix E - Part 2, "Pollutant Loading Analysis for the Proposed Costco Yorktown Site" prepared by HDR and dated July 8, 2014, in the FEIS, does not provide calculations for future pollutant loads without treatment. In addition, another table should

be provided to explain the reduction of the future loads by sub-area, through multiplying the pollutant removal efficiency factor, achieved through stormwater remedial technologies, by each load to quantify the amount of pollutants leaving the site. These calculations should be re-done after the site's infiltration system has been re-configured as noted in Section I above. There should be no additional credit taken for pollutant removal for sub-soil whose infiltration rates exceed the design criteria.

An example of the application of the simple method to evaluate phosphorus loading at the Costco site is presented below. In this example, the simple method quantifies the pounds of phosphorus released from a site by stormwater in the existing condition (pre-development), in the future condition (post-development without stormwater treatment), and in the future condition with stormwater treatment designed to remove phosphorus. In summary, based on the project in its current form, the estimated amount of total phosphorus leaving the site in the future with stormwater treatment is ~23.6 pounds or 2.2 times the existing condition of 10.5 pounds of phosphorus.

The derivation of these calculations is set forth below:

#### Total Phosphorus Loading Analysis – Simple Method

Design Area (DA) Existing	22.72 acres
DA Future	24.8 acres (Due to added road drainage)
DA Future with Treatment	1) Hot Spot Fueling Facility 2) Road Drainage Pre & Post
Annual Precipitation, P = 49.5"	

Calculations are based on the total drainage area plus the actual site disturbance.



Existing Condition Area Breakdown:

Land Use	Area (acres)	% Impervious	Runoff Coefficient (Rv)	Total Phosphorus (TP) Concentration (mg/l)	TP Pollutant Load (pounds)
Forest	11.91	2	0.068	0.11	0.9
Rural Open	7.2	2	0.068	0.11	0.5
Commercial	3.28	78	0.752	0.33	8.2
Industrial/Hwy	0.34	72	0.698	0.38*	0.9
Total	22.73				10.5

\* Average of industrial (0.32mg/l) and highway (0.43mg/l)

Future Condition Area Breakdown (without stormwater treatment):

Land Use	Area (acres)	% Impervious	Runoff Coefficient (Rv)	Total Phosphorus (TP) Concentration (mg/l)	TP Pollutant Load (pounds)
Forest	7.37	2	0.068	0.11	0.6
Rural Open	3.87	2	0.068	0.11	0.3
Commercial	13.04	78	0.752	0.33	38.9
Hwy	0.52	100	0.95	0.43	2.1
Total	24.8				41.9

Based on the July 8, 2014 HDR Report entitled "Pollutant Loading Analysis for the Proposed Costco Yorktown Site" in Appendix E - Part 2 of the FEIS, the post-developed drainage areas DA-P2b-1 & 2, 6, & 8 are treated with infiltration after Vortech unit pre-treatment.

The total area designated for treatment by infiltration is 14.95 acres, consisting of 12.75 acres of commercial land and 2.2 acres of rural open land. Of the 12.75 acres of commercial land, the 0.184 acres of the fueling facility "hot spot" is treated with a sand filter (Appendix E of the Costco FEIS titled "Stormwater Management (Part 1)". The efficiency of sand filters to remove total phosphorus (TP) is 50% (2012 bmpdatabase.org. for media filters). In addition, the efficiency of Vortech type units in removing TP is 37% (2012

bmpdatabase.org). The efficiency of infiltration to remove TP is usually 65%. However, due to the extremely high infiltration rates of 14.5 to 19.5 inches per hour, which is greater than twice the maximum allowable "limit", as stated in the 1992 NYSDEC Reducing Impacts Manual, no credit is given for this infiltration system or the subsoil.

Therefore, we have treatment as follows:

- 1) Hot Spot (gas station) - 0.184 acres @ 100% imperviousness generates:

$$(49.5)(0.9)(.95)(0.184)(.33)(.227) = 0.6 \text{ pounds of TP}$$

$$0.6 \text{ pounds reduced } 50\% = 0.3 \text{ pounds}$$

Although this outflow travels to the Vortech unit as another pre-treatment to infiltration – no added reduction is realized here since the sand filter has already reduced the same particle sizes that are normally captured in the Vortech unit.

- 2) Commercial Area – 12.566 acres @ 78% imperviousness generates:

$$(49.5)(0.9)(0.752)(12.56)(0.33)(0.227) = 31.54 \text{ pounds of TP}$$

$$31.54 \text{ pounds reduced } 37\% = 19.8 \text{ pounds}$$

- 3) Open Area – 2.2 acres @ 2% imperviousness generates:

$$(49.5)(0.9)(0.068)(2.2)(0.11)(0.227) = 0.1 \text{ pound – negligible}$$

#### Remaining Untreated Loads

Forest (7.37 acres)	0.6 pounds of TP
---------------------	------------------

Rural Open (1.85 acre)	0.1 pounds of TP
------------------------	------------------

Commercial (0.29 acres)	0.7 pounds of TP
-------------------------	------------------

Highway (0.52 acres)	<u>2.1 pounds of TP</u>
----------------------	-------------------------

3.5 pounds of TP

Therefore, the Total Remaining TP Post-Treatment equals ~23.6 pounds or 2.2 times the original load of 10.5 pounds.



### III. Need for Off-Site Reductions in Stormwater Pollution

New sources of pollution in a drainage basin, such as the New Croton Reservoir Watershed that do not meet water quality standards, are not permitted under federal and state water pollution laws. Before the Costco Wholesale project is approved, the developer must offset pollution increases on site with pollution reductions off site. In addition, the developer should contribute additional offsite reductions to achieve the total maximum daily load for total phosphorous in the New Croton Watershed Basin. Offsets could be accomplished by contributing funds to the Town or to another appropriate government entity to construct stormwater retrofit projects, as was done in the Bridleside project (formerly known as "Salem Hunt") within the Town of North Salem.

The analysis below provides a rough estimate of the cost of the retrofit contribution assuming there are no changes to the stormwater pollution prevention plan ("SWPPP"). If the SWPPP is modified in accordance with these comments, the net increase in phosphorus loads, and cost of the retrofit contribution, should be reduced substantially. Accordingly, the purpose of these calculations is simply to illustrate an appropriate method for calculating the net increase and retrofit cost, once needed changes to the SWPPP are made.

Pre-development: 10.5 pounds of phosphorus

Post-development: 23.6 pounds of phosphorus (after treatment)

Therefore, 23.6 pounds – 10.5 pounds = 13.1 pounds. This is the net increase in the annual phosphorus load for this site. As discussed above, this is likely to be a conservative estimate of the net increase based on the Sponsor's current plans. On the other hand, appropriate modifications of the SWPPP

in a revised FEIS or supplemental DEIS can reduce the on-site net increase in phosphorus.

In addition, the NYCDEP March 1999 "Proposed Phase II Phosphorus TMDL Calculations for New Croton Reservoir," demonstrates that the current modeled phosphorus load delivered to the reservoir exceeds the allowable carrying capacity/phosphorus load being supplied to the reservoir, or the total maximum daily load (TMDL). As a result, the TMDL is being exceeded by 13%. To meet the TMDL requirements, a 13% reduction in total phosphorus must be realized from the pre-development annual phosphorus load. Therefore, 0.13 multiplied by 10.5 pounds (the predevelopment loading) = 1.4 pounds. Thus, the total off-site phosphorus obligation should be to reduce 1.4 pounds + 13.1 pounds (increase in loading because of development) = 14.5 pounds of phosphorus per year.

In order to calculate the cost to remove 14.5 pounds of phosphorus per year from the New Croton Reservoir watershed, the estimated loading for the proposed project site was used. The estimated loading served as the basis for determining how many acres of land, with similar land use, would need to be managed off-site to reduce the requisite total phosphorus load. The calculations below illustrate how pounds per year are converted to acres of impervious cover. The proposed stormwater treatment system is expected to remove approximately 12.1 pounds of total phosphorus in stormwater. As a result, more stormwater needs to be captured and treated to insure the calculated target reduction of 14.5 pounds per year.

Since we are only concerned with pollutant loading from developed land, we segregated the post-development site that drains to the best management practices (BMPs) from the total site. Minus the proposed phosphorus controls, the post-development site produces 41.0 pounds of total phosphorus load per year from 10.69 acres of impervious cover. This was



determined from the HDR Pollutant Load Analysis that contained data of impervious area for the sub-areas. By dividing 41.0 pounds of total phosphorus load per year by 10.69 acres of impervious cover, we get 3.84 pounds of phosphorus per impervious acre.

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So, to meet the 14.5 pounds/year phosphorus reduction obligation, the applicant would have to manage 6.87 acres of impervious area from suburban land uses. This 6.87 acre value was calculated as follows:  $14.5 \text{ pounds} / 3.84 \text{ pounds per impervious acre} / 0.55 \text{ (assumed future pollutant removal system effectiveness of 55\% for total phosphorus)} = 6.87 \text{ acres}$ .

Based on work performed by the Center for Watershed Protection 2007 manual entitled "Urban Stormwater Retrofit Practices," and stormwater retrofit work completed in other locations within the New York City watershed, the general cost range for stormwater retrofitting is between \$40,000 and \$80,000 per impervious acre, for typical suburban land uses. So, using the mid-point of  $\$60,000/\text{acre} = 6.87 \text{ acres} \times \$60,000 = \$412,200$  in 2007 dollars for stormwater pollution mitigation at the Costco Wholesale Project. Adjusted to 2014 dollars, using a consumer price index (CPI) multiplication factor of 1.14801, the total cost for stormwater retrofits is estimated to be \$473,210. Again, this estimate assumes that the sponsor will not implement the improvements to the SWPPP requested in these comments. Upon implementation of those improvements, the amount of needed phosphorus offsets and their cost should be significantly lower.

#### IV. Other Needed Revisions to the SWPPP

##### 1. Outdated Hydrology Data

As noted earlier in my DEIS Technical Appendix comments, dated December 19, 2012, Section II. Hydrology, the stormwater hydrology calculations for this site are based on outdated data. Specifically, the FEIS

continues to use the outdated TP-40 rainfall values with SCS Type 3 rainfall distribution values. Although the FEIS did compare the outdated TP-40 rainfall values to the newer NRCC rainfall values (January 2011), the misapplication of SCS Type 3 rainfall distributions to the rainfall values invalidated the hydrology calculations. In order to be evaluated correctly, the entire NRCC rainfall table must be imported into the HydroCAD model. The model can then create individual rainfall distributions for each storm event. Once this step is completed, the NRCC rainfall values and distributions are evaluated to determine the correct stormwater discharge and runoff values.

## 2. Erosion and Sediment Control Details

Although the applicant has added significant information and detail to the erosion and sediment control plan and construction sequencing, they have not provided construction details for a concrete truck washout facility. This issue was identified as a deficiency in my DEIS Technical Appendix comments (Section VI. Inadequate Erosion and Sediment Controls Comment 1). This information must be provided. Guidance for this practice is found in the New York Contractors Erosion and Sediment Control Field Notebook, Third Edition, January 2013, pages 16 through 18. In addition, the location of a concrete truck washout facility needs to be added to the Erosion & Sediment Control Plan View drawings for construction phases 2 through 5.

## 3. Offsite Erosion and Sediment Plan for Highway Work

There are no plans or details included in the FEIS for erosion and sediment control for the highway improvements and drainage work to be done in concert with this project. This omission was listed as a deficiency in my Draft EIS Technical Appendix Section VI. Inadequate Erosion and Sediment Controls Comment 3, dated December 19, 2012. These details need to be incorporated into the FEIS.



The FEIS, SWPPP, Appendix E, Part 1, Table 3-6, indicates that there will be an additional 0.77 acres of new impervious area created, but omits the actual amount of surrounding acres that will be disturbed to construct this impervious area. This value should be added to the table.

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#### 4. Fertilizers

The New Croton's drainage basin is a "phosphorous restricted basin" because phosphorus concentrations exceed DEC guidelines (See 10 NYCRR §§ 128-1.6(a)(80), 4.1(c)). Drawing C-402A calls for a fertilizer amendment of 5-10-10 (representing the nitrogen-phosphorus-potassium ratio) for seeding grass. Prior to the introduction of fertilizer, soil tests should be performed at the applicable areas on-site to quantify how much phosphorus is actually needed to promote grass seed growth. Soil test results will prescribe how much phosphorus fertilizer should applied at the site.

#### 5. Miscellaneous Additional Comments

- a. It appears the drawing C-601 "Site Line Sections", has not been updated to show the FEIS retaining wall on the western boundary of the project.
- b. Section E-E shown on drawing C-701A shows the pond retaining wall which is 18 feet high, with 14 feet of the wall exposed above grade. However, the stabilization footer for the wall is absent from the drawing. This detail should be added.
- c. Drawing C-402C shows a topsoil pile located within the proposed active work area. The topsoil pile should be re-located outside the active work area to allow freedom of movement for construction equipment.
- d. There are no details on drawing C-402D that show the flow outlets from sediment trap ST-4. These details need to be provided.

- e. Drawings C-701A and C-701B show typical cross-sections of the proposed dry stormwater pond on the north end of the project. However, not all of these section location lines are shown on the plan view drawings. Section E-E on 701A appears to be very close to Section B-B on drawing C701B, but the location of Section B-B is not shown and the retaining wall height between these two sections differs by approximately 4 feet. These two sections would also compare to section K-K shown on C-604 and located in the plan view on C-201. These sections and their locations need to be reconciled for agreement.





Emily Lloyd  
Commissioner

November 13, 2014

Mr. John Tegeder, Director of Planning  
Town of Yorktown  
1974 Commerce Street  
Yorktown Heights, New York 10598

Paul V. Rush, P.E.  
Deputy Commissioner  
Bureau of Water Supply  
prush@dep.nyc.gov

465 Columbus Avenue  
Valhalla, New York 10595  
T: (845) 340-7800  
F: (845) 334-7175

Re: **Costco Wholesale Store & Fueling Facility – FEIS**  
**Town of Yorktown, Westchester County, NY**  
**Tax map #: 26.18-1-17, 18, & 19 and 26.19-1-1**  
**DEP Log#: 2010-CNC-0624-SQ.1**

Dear Mr. Tegeder and Members of the Planning Board:

The New York City Department of Environmental Protection (DEP) has received the Final Environmental Impact Statement (FEIS) dated October 6, 2014 and accepted on October 21, 2014 for the above referenced project.

DEP has met with the project sponsor to discuss remaining concerns about the project's potential to cause adverse water quality impacts. As the FEIS includes substantial technical information which was not previously presented, DEP appreciates the opportunity for the extended review time and offers the following combination of general and technical comments on the proposed action:

1. *The Pollutant Loading Analysis provided in Appendix E is inadequate for determining potential water quality impacts from new impervious surfaces because the model used is flawed and not reasonably applied.*
  - a. The pollutant loading analysis assumes that existing soils between the infiltration practice and Wetlands A function as filtering practices in series. No scientific or technical basis is provided for this assumption. Structural filtering practices generally specify filter media and compaction so that reasonable assumptions of permeability coefficients can be made. In addition, filter practices can be maintained over time – filter media replaced, permeability modified, etc. – in-situ soils would fail to meet these criteria. Further, the pollutant treatment efficiency assumed for these practices in series is overestimated. Most importantly, the analysis does not address depth to groundwater in the in-situ soils which may have a profound impact on the soil's ability to remove pollutants.
  - b. The pollutant loading analysis is not conducted on a sub-drainage area basis. Rather, the analysis is general in nature separating out areas tributary to Wetland A and all other areas. Since the other sub-drainage areas may be tributary to other surface water features, the analysis does not take into consideration increases in

- pollutant loading and adverse impacts to each of these other receiving water features.
- c. The pollutant loading estimate micro-analyzes surface cover types. As loading coefficients are for planning purposes, and thus, not exact enough for analyzing areas as small as 0.01 acre, this is not an appropriate use of the chosen pollutant loading method.
  - d. The basis for loading rates for the fecal coliform analysis should be provided. It must be noted that although no removal rates are assumed, the loads are reduced because the rates for impervious cover are lower than for vegetative areas.
  - e. The pollutant loading analyses is flawed because it takes credit (removal rates) for multiple practices where there is only one proposed. As you are aware, the project site is located in a water supply drainage basin that does not meet its phosphorous Total Maximum Daily Load (TMDL) as designated by the New York State Department of Environmental Conservation (NYSDEC).
  - f. The pollutant loading analysis provided does not include an analysis for the activities associated with the sewer extension along Old Crompond Road. As these improvements are part of the action, their potential impact should be included in the analysis.
2. *The stormwater practice proposed for the site may not be viable for the amount of new impervious surfaces proposed.* The SWPPP provided in Appendix E notes that the primary practice for stormwater management is an infiltration system which consists of a single 150 foot long by 15 foot wide concrete chamber preceded by three stormwater storage chambers of the same size; however, based upon review of the Hydrocad analysis, all four of these structures were incorrectly modeled as infiltration chambers. The stormwater management practice, as currently proposed, does not meet NYSDEC or DEP standards and thus is not approvable for the following reasons:
- a. The storage volume available below the primary outflow is slightly less than the volume of the required one-year 24-hour storm;
  - b. The tributary drainage area is approximately 3 times as large as the maximum tributary area per the New York State Stormwater Management Design Manual (NYSSMDM) (5 acres maximum tributary area may be directed to an infiltration trench, whereas the Hydrocad report represents the tributary area as 14.94 acres);
  - c. Based on DEP field notes, there may be insufficient separation to bedrock in the specified location;
  - d. An insufficient amount of soil testing has been conducted along the length of the trench within proposed areas based on requirements of the NYSSMDM;
  - e. The notably fast percolation rate in the vicinity of the infiltration trench suggests that the soils may not provide the amount of treatment assumed in the pollutant loading model and the variable depth to bedrock beneath the system suggests that lateral movement along the soil-rock interface limits the filtration ability of the practice and existing soils.
3. There is no analysis of the potential adverse impacts that may result from the significant alteration of drainage areas and the hydraulic loading from the infiltration trench on the stability, hydro period or beneficial functions of Wetland A. Based on the amount of water that is proposed to be distributed into the ground up gradient of Wetland A, it is



recommended that a mounding analysis including an assessment of soil and wetland conditions be conducted to demonstrate that Wetland A will not be adversely impacted by the proposed stormwater design.

4. Although infiltration is being proposed as the primary stormwater management practice, a standard practice with Runoff Reduction Value (RRV) capacity, there is no attempt at realistic source control of runoff. Rather, runoff is rerouted from many disparate drainage areas and discharged into a single 150 foot long trench in close proximity to a wetland.
5. The Construction Sequence Plans and Erosion & Sediment Control Plans do not demonstrate that the action can be constructed without potential impacts. The limits of disturbance do not consider grade changes for each phase of construction. The construction notes employs a generic format for each phase and do not clearly indicate which items will be constructed in each phase. The construction sequence for the site must be keyed to specific erosion controls and maintenance activities that are proposed for this project to minimize the potential for sediment migration. In addition, the notes on Sheet C-402A state...*stormwater from disturbed areas must be passed through a hay bales barrier*... Experience has shown that hay bales do not filter stormwater but rather cause the stormwater to flow around the hay bales resulting in additional erosion and sedimentation. This note must be revised in accordance with the practices included in the *New York Standard Standards and Specification for Erosion and Sediment Control*.
6. Cut and fill balances should be provided for each phase so that realistic stockpile areas, limits of disturbance, etc., can be determined. Access routes to non-contiguous work areas in each phase should be provided, particularly in Phase 1.
7. The DEP flagged watercourse is not shown on any of the drawings other than the 'existing conditions' plan. The plans must be revised accordingly to show the watercourse and the associated 100-foot restrictive limiting distance.
8. The Alternate Sewage Disposal System may only be located under an impervious surface, such as the asphalt parking area, provided that the effluent is treated by a Wastewater Treatment Plant as defined in Section 18-16(a)(125) of the *Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and its Sources*.

Thank you for the opportunity to provide comments. You may reach the undersigned at [cgarcia@dep.nyc.gov](mailto:cgarcia@dep.nyc.gov) or (914) 773-4455 with any questions or if you care to discuss the matter further.

Sincerely,



Cynthia Garcia  
SEQRA Coordination Section

X: D. Whitehead, NYSDEC  
S. Jobson, NYSDOT  
SEQR Unit, ACOE  
E. Buroughs, AICP, WCDP  
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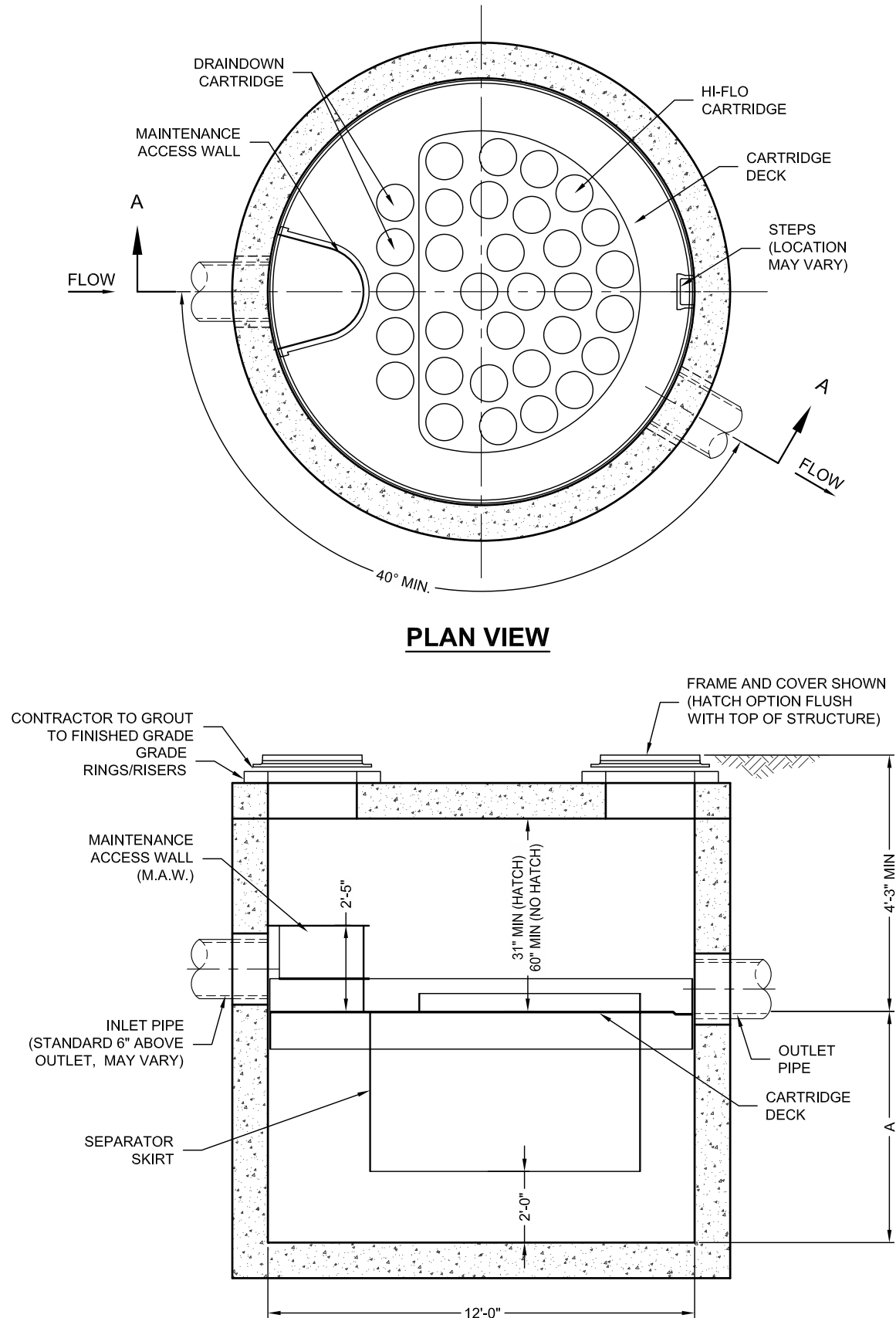
### **Appendix B**

Jellyfish<sup>®</sup> Filter Standard Detail

January 2013 Washington State Department of Ecology (WSDE) document

Jellyfish<sup>®</sup> Filter NJCAT verification

C:\USERS\BLANKENSHIP\DESKTOP\-- CAD --\--ALL SPECIAL PROJECTS--\11 JELLYFISH STANDARD DETAILS\JF12-DTL.DWG 1/7/2014 9:04 AM



PLAN VIEW

SECTION A-A

Jellyfish® Filter

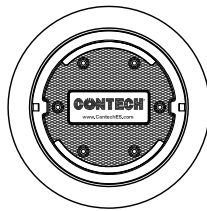
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENT NO. 8,287,726, 8,221,618 & US 8,123,935; OTHER INTERNATIONAL PATENTS PENDING

## JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø144" MANHOLE JELLYFISH PEAK HYDRAULIC CAPACITY IS 5.26 CFS. IF THE SITE CONDITIONS EXCEED 5.26 CFS AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

### CARTRIDGE SELECTION

CARTRIDGE DEPTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (C)	6'-5"	5'-3"	4'-2"	3'-2"
FLOW RATE HIGH-FLO / DRAINDOWN (cfs) (per cart)	0.18 / 0.09	0.13 / 0.065	0.09 / 0.045	0.05 / 0.025
MAX. CARTS HIGH-FLO / DRAINDOWN	27 / 5			



### FRAME AND COVER

(DIAMETER VARIES)  
N.T.S.

### HATCH

(84" x 102" CAST INTO SLAB)  
N.T.S.

### GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.ContechES.com](http://www.ContechES.com)
- JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
- STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- JELLYFISH STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

### INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN ON SITE SPECIFIC DRAWINGS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW CARTRIDGE DECK ARE GROUTED.
- CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION.

### SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	* / *
CARTRIDGE SIZE	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*
---------------	---

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

\* PER ENGINEER OF RECORD

**CONTECH**  
ENGINEERED SOLUTIONS LLC

[www.ContechES.com](http://www.ContechES.com)

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JF12  
STANDARD DETAIL





January 2013

**CONDITIONAL USE LEVEL DESIGNATION FOR BASIC TREATMENT  
And  
PILOT USE LEVEL DESIGNATION FOR PHOSPHORUS AND OIL  
TREATMENT  
For  
Imbrium Systems Jellyfish® Filter**

**Ecology's Decision:**

1. Based on Imbrium Systems Corporation's application submissions, Ecology hereby issues:
  - Conditional use level designation (CULD) for the Imbrium's Jellyfish Filter as a basic treatment device for total suspended solids (TSS) removal
  - Pilot use level designation (PULD) for phosphorus removal and oil treatment.
  - Size Jellyfish Filter units in accordance with the company guidelines submitted to Ecology (Dated April 27, 2012). Imbrium Systems bases sizing on flow rate and sediment load, according to Tables 1 and 2.
2. The table below illustrates the hydraulic and sediment load capacities associated with various Jellyfish filter cartridges.

Table 1. Jellyfish cartridge hydraulic loading rates and sediment capture capacity.

<b>Cartridge Length</b>	<b>Design Treatment Flow Rate</b>	<b>Design Sediment Mass Loading Capacity</b>
15 inches	Hi-Flo 22 gpm	Hi-Flo 35 lbs
	Draindown 11 gpm	Draindown 17 lbs
27 inches	Hi-Flo 40 gpm	Hi-Flo 63 lbs
	Draindown 20 gpm	Draindown 31 lbs
40 inches	Hi-Flo 60 gpm	Hi-Flo 93 lbs
	Draindown 30 gpm	Draindown 46 lbs
54 inches	Hi-Flo 80 gpm	Hi-Flo 125 lbs
	Draindown 40 gpm	Draindown 63 lbs

**Table 2. System sizing illustration**

<b>Manhole Diameter (ft / m)</b>	<b>Model No.</b>	<b>Hi-Flo Cartridges <sup>1</sup> 54 in / 1372 mm</b>	<b>Draindown Cartridges <sup>1</sup> 54 in / 1372 mm</b>	<b>Treatment Flow Rate (gpm / cfs)</b>	<b>Treatment Flow Rate (L/s)</b>
Catch Basin		varies	varies	varies	varies
4 / 1.2	JF4-2-1	2	1	200 / 0.45	12.6
6 / 1.8	JF6-3-1	3	1	280 / 0.62	17.
	JF6-4-1	4	1	360 / 0.80	22.7
	JF6-5-1	5	1	440 / 0.98	27.8
	JF6-6-1	6	1	520 / 1.16	32.8
8 / 2.4	JF8-6-2	6	2	560 / 1.25	35.3
	JF8-7-2	7	2	640 / 1.43	40.4
	JF8-8-2	8	2	720 / 1.60	45.4
	JF8-9-2	9	2	800 / 1.78	50.5
	JF8-10-2	10	2	880 / 1.96	55.5
10 / 3.0	JF10-11-3	11	3	1000 / 2.23	63.1
	JF10-12-3	12	3	1080 / 2.41	68.1
	JF10-12-4	12	4	1120 / 2.50	70.7
	JF10-13-4	13	4	1200 / 2.67	75.7
	JF10-14-4	14	4	1280 / 2.85	80.8
	JF10-15-4	15	4	1360 / 3.03	85.8
	JF10-16-4	16	4	1440 / 3.21	90.8
	JF10-17-4	17	4	1520 / 3.39	95.9
	JF10-18-4	18	4	1600 / 3.56	100.9
	JF10-19-4	19	4	1720 / 3.83	108.5



Manhole Diameter (ft / m)	Model No.	Hi-Flo Cartridges <sup>1</sup> 54 in / 1372 mm	Draindown Cartridges <sup>1</sup> 54 in / 1372 mm	Treatment Flow Rate (gpm / cfs)	Treatment Flow Rate (L/s)
12 / 3.6	JF12-20-5	20	5	1800 / 4.01	113.6
	JF12-21-5	21	5	1880 / 4.19	118.6
	JF12-22-5	22	5	1960 / 4.37	123.7
	JF12-23-5	23	5	2040 / 4.54	128.7
	JF12-24-5	24	5	2120 / 4.72	133.8
	JF12-25-5	25	5	2200 / 4.90	138.8
	JF12-26-5	26	5	2280 / 5.08	143.8
	JF12-27-5	27	5	2360 / 5.26	148.9
Vault		varies	varies	varies	varies

1. Shorter length cartridge configurations are available. See Table 1.

3. Ecology approves Jellyfish Filter units for treatment at the hydraulic loading rates shown in Table 1, to achieve the maximum water quality design flow rate. Calculate the water quality design flow rates using the following procedures:

- Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. The use level designations expire on June 30, 2015 unless Ecology extends the date, and are subject to the conditions specified below.

#### Ecology's Conditions of Use:

Jellyfish Filter units shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain Jellyfish Filter units in accordance with Imbrium Systems' applicable manuals and documents and the Ecology Decision.
2. Imbrium uses sediment-loading capacity, in conjunction with the water quality design flow rate, to determine the target maintenance interval.

3. Imbrium Systems commits to submitting a QAPP for Ecology review and approval by March 31, 2014 that meets the TAPE requirements for attaining a GULD for basic, phosphorus, and oil treatment. Ecology must review and approve QAPPs for each field site (maximum of five sites) in Washington State. The selected sites should reflect the product's treatment intent.
4. Local jurisdictions must file a "Pilot Level Technologies Notice of Intent" form with the Department of Ecology prior to authorizing Jellyfish Filter for any pilot use level installation.
5. Imbrium Systems shall complete all required testing and submit a TER for Ecology review by July 31, 2015.
6. Imbrium Systems may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.
7. Discharges from the Jellyfish Filter units shall not cause or contribute to water quality standards violations in receiving waters.

**Applicant:** Imbrium Systems Corporation  
**Applicant's Address:** 3811 SW Corbett Avenue  
Portland, OR 97239

**Application Documents:**

- Application Letter for CULD for Jellyfish Filter - Basic Treatment, Phosphorus Treatment, and Oil Treatment, dated April 27, 2012.
- Letter from Imbrium Systems dated September 4, 2012 regarding the draft CULD/PULD document.
- *TAPE Analysis of Jellyfish Filter UF Field Study Data*, prepared by Stormwater Management Services, LLC.
- *TARP Field Test Performance Monitoring of a Jellyfish Filter JF4-2-1. Performance Monitoring Report for JF4-2-1* Prepared By: University of Florida, Engineering School of Sustainable Infrastructure and Environment (ESSIE), University of Florida, Gainesville, FL 32611. Final Version: 01 November 2011.
- *Jellyfish Filter Systems Evaluation Report in Consideration for Pilot Level Designation (PLD) for Imbrium Systems Corporation*, by Gary R. Minton, PhD, PE, with Resource Planning Associates in Seattle, Washington May 7, 2008 (updated July 1, 2008).
- *NJCAT Technology Verification, Jellyfish Fine Sediment Filter*, by the New Jersey Corporation for Advanced Technology (NJCAT) Program Imbrium Systems Corporation, June 2008



**Applicant's Use Level Request:**

- General use level designation as a basic, phosphorus, and oil treatment device in accordance with Ecology's 2011 *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)* Table 2.

**Applicant's Performance Claims:**

Based on results from a laboratory test system, the applicant claims:

- Jellyfish Filter Systems has the capability to remove 80% of total suspended solids from stormwater runoff from sites with influent concentrations between 100 mg/L and 200 mg/L and provide effluent concentrations of 20 mg/L or less with influent concentrations less than 100 mg/L given a typical particle size distribution.
- Sampling of effluent found an average D90 of about 14 microns indicating the Jellyfish Filter System capable of removing most particles above 15 microns. This suggests the high likelihood that field studies will demonstrate the technology can meet the goal of Basic Treatment.
- Data collected for 25 storm events during third-party field monitoring of the Jellyfish Filter at the University of Florida demonstrated median Total Phosphorus removal efficiency of 59%. These field monitoring results suggest the Jellyfish Filter can likely meet Ecology's goal for Phosphorus Treatment.
- Data collected for 25 storm events during third-party field monitoring of the Jellyfish Filter at the University of Florida demonstrated median Oil and Grease removal efficiency of 62%, despite median influent Oil and Grease concentration less than 1 mg/L. These field monitoring results suggest the Jellyfish Filter can likely meet Ecology's goal for Oil Treatment.

**Recommendations:**

Ecology finds that:

- Imbrium Systems qualifies for the opportunity to demonstrate, through field-testing in the Pacific Northwest, whether the Jellyfish Filter can attain Ecology's basic, phosphorus, and oil treatment goals.

**Findings of Fact:**

1. Laboratory Testing and Results – Imbrium conducted testing at the Monteco Limited Research & Development Centre (RDC) in Mississauga, Ontario with third party testing oversight provided by Prof. James Li of Ryerson University in Toronto. The laboratory set-up used a single cartridge fitted into a tank sized to be 1/7 the volume of a full-scale 7-cartridge Jellyfish Filter system. Based on the lab test results:
  - A Jellyfish Filter system fitted with a single Jellyfish cartridge or multiple Jellyfish cartridges can remove greater than 86% Sil-Co-Sil 106 (mean particle size 22 microns) within a 95% confidence interval of +/- 1.3% at the system's 100% operating rate with influent sediment concentrations ranging from 100 to 300 mg/L. For systems using 12-inch diameter cartridges, each cartridge containing 91 filtration tentacles of 54-inch

length, the 100% operating rate is 50 gpm per cartridge operating at 12 inches driving head (i.e., 0.66 gpm/ft<sup>2</sup>). Each (of the) 91 filtration tentacles is composed of three 18-inch long segments for a total length of 54 inches with 76 ft<sup>2</sup> of surface area (first generation membrane filtration cartridges).

- Test runs at 100 mg/L influent concentration resulted in effluent concentrations ranging from 12 to 21 mg/L. Ten of the 11 test runs had effluent less than 20 mg/L (as required for Basic Treatment).
- 
- Sampling of effluent found an average D90 of about 14 microns indicating the Jellyfish Filter System is capable of removing most particles above 15 microns.
2. Field Testing Results (second-generation membrane filtration cartridges) – University of Florida (Gainesville, FL) installed and tested a Jellyfish JF4-2-1. The University conducted monitoring of the system from May 28, 2010 to June 27, 2011, with runoff from 15.01 inches of rainfall. The monitoring followed the Technology Acceptance Reciprocity Partnership (TARP) field test protocol, per the guidelines of the New Jersey Department of Environmental Protection (NJDEP). The New Jersey Corporation for Advanced Technology (NJCAT), on May 14, 2012 certified the Jellyfish Filter for 80 percent TSS removal.
- The JF4-2-1 operating at a maximum treatment flow rate of 200 gpm provided a median total suspended solids (TSS) removal of 89 percent, and a median suspended sediment concentration (SSC) removal of 99 percent. Influent TSS concentrations ranged from 16.3 to 261.0 mg/L. TSS concentrations in the range of 20-100 mg/L were reduced to less than 20 mg/L for 16 of 17 events. Average TSS removal for influent TSS between 100-200 mg/L was 90 percent.
  - Other median pollutant removals included: total phosphorus, 59 percent; total nitrogen, 51 percent; total copper, 90 percent; and total zinc 70 percent.
  - Total oil and grease influent concentrations ranged from 0.2 to 4.1 mg/L, with a median removal efficiency of 62 percent.
  - No maintenance was required or carried out during the 13-month monitoring period. Curves of head loss versus flow rate were nearly identical for the system with fresh cartridges (beginning of monitoring) and dirty cartridges (end of monitoring period). The sump and filter cartridges captured 166 pounds of dry basis particulate matter.
  - Runoff treated by the JF4-2-1 was from a nearby parking lot (approximately 75 percent pavement and 25 percent planting islands). Depending on storm event intensity and wind direction, the drainage area varied from 0.12 to 0.20 acres.



**Other Jellyfish Filter Related Issues to be Addressed By the Company:**

1. Test the system under normal operating conditions, such that pollutants partially fill the settling basin. Results obtained for “clean” systems may not be representative of typical performance.
2. Conduct field-testing at sites that are indicative of the treatment goals.
3. Conduct testing to obtain information about maintenance requirements in order to come up with a maintenance cycle.
4. Conduct loading tests on the filter to determine maximum treatment life of the system.

**Technology Description:** Download at: [www.imbriumsystems.com](http://www.imbriumsystems.com)

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Ecology web link: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>

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**Revision History**

Date	Revision
August 2008	PULD granted
January 2012	PULD Extension granted
September 2012	CULD for Basic treatment; PULD for Oil and Phosphorus treatment.
January 2013	Modifications to format document in line with other Use Level Documents, Changes dates for QAPP, TER, and Expiration

## VERIFICATION

To: Imbrium Systems Corporation  
7564 Standish Place  
Suite 112  
Rockville, MD 20855-2745

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Re: Identification of Technology  
**Jellyfish® Filter**

Identification of Claims

**Technical Performance Claim – Suspended Solids Removal**

Field testing of an Imbrium Systems' Jellyfish® Filter model JF4-2-1 with second-generation filtration cartridges was conducted in accordance with the TARP field test protocol to document Jellyfish® Filter performance with respect to suspended solids removal and quantify water treatment performance. The field monitoring was carried out on the University of Florida campus with the full-scale unit loaded by rainfall-runoff from a surface parking watershed. A total of 25 monitored storm events, with 15 inches of cumulative rainfall depth, were treated by the JF4 during this study. These 25 storms produced the total runoff through the JF4 during the 13-month monitoring period. Of the 25 storms treated, two storms generated flows exceeding the maximum design flow of 200 gpm. No maintenance was required or conducted during the 13-month monitoring period spanning May 28, 2010 to June 27, 2011. The median  $d_{50}$  for influent and effluent particle sizes were 82 and 3  $\mu\text{m}$ , respectively. *Treatment results generated median SSC and TSS removal efficiency results of 99% and 89%, respectively.*

This will confirm that NJCAT has concluded the evaluation of the above captioned claim for the above captioned technology, pursuant to your application and our mutually agreed plan of evaluation. NJCAT is pleased to provide a copy of the final report, "NJCAT Technology Verification - Jellyfish® Filter", detailing the procedures that evaluated the claim. The report documents the final verification of the Jellyfish® Filter technology having completed field evaluation in accordance with the TARP Tier II Protocol (TARP, 2003) and New Jersey Tier II Stormwater Test Requirements—Amendments to TARP Tier II Protocol (NJDEP, 2006).

NJCAT is pleased to confirm that the above captioned claim has been verified by our review procedures and that Imbrium Systems Corporation may use the notation "NJCAT Verified" and the Verification Mark in its literature describing the claim in accordance with this Verification Agreement.





Imbrium Systems Corporation (Imbrium) agrees that the notation "NJCAT Verified" and the Verification Mark will only be used in connection with the above-captioned claim and the above-captioned technology. Breach by Imbrium of these conditions of use may result in the withdrawal of this verification and the right to use the notation "NJCAT Verified" and the Verification Mark. Imbrium agrees to provide NJCAT, upon request, with sample copies of any literature in which the notation "NJCAT Verified" or the Verification Mark are used. Any third party who submits a written inquiry to NJCAT concerning this Verification, may be provided with a copy of this Verification Agreement, the final report, and any subsequent correspondence and/or revocation of Imbrium's rights hereunder, upon terms and conditions established by NJCAT.

In consideration for participation in the NJCAT Technology Verification Program, the undersigned hereby releases and holds harmless NJCAT, its officers, directors, trustees, employees, members and subcontractors from any and all damages, claims and liabilities arising out of participation by Imbrium in the NJCAT Technology Verification Program.

Please confirm your acceptance of this Verification Agreement by executing the enclosed copy of this verification Agreement and returning the same to NJCAT.

**New Jersey Corporation for  
Advanced Technology**

A handwritten signature in cursive script, reading "Richard S. Magee".

**By:  
Richard S. Magee  
Technical Director**

**Date: 2/4/12**

**Imbrium Systems Corporation**

A handwritten signature in cursive script, reading "Joel Garbon".

**Accepted:  
Joel Garbon  
Product Manager**

**Date: 2/13/12**



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### **Appendix C**

Tabular Results – Amended Pollutant Loading Computations by HDR



Table 1. Summary of Pre and Post Construction Loading, Wetland A

Pollutants	Wetland A					
	Pre Load, lb/yr	Post Load, lb/yr	Post Jellyfish Load, lb/yr	Post Jellyfish & Vortechs Load, lb/yr	Post Jellyfish, Vortechs and Infiltration, lb/yr	Post Jellyfish, Vortechs, Infiltration and Lateral Soils, lb/yr
BOD	156	2678	225	225	151	42
TP	2.2	35	15	10	6.9	0.8
TN	36	336	173	160	117	19
TSS	1543	10926	1749	1617	1216	615
Lead	0.62	12	2.4	1.9	1.2	0.10
Copper	0.64	10	1.2	1.1	0.7	0.17
Zinc	0.71	11	3.6	2.8	1.7	0.17
Oil&Grease	24	468	181	66	46	6
						17

Table 2. Summary of Pre and Post Construction Loading, Entire Site

Pollutants	Entire Site					
	Pre Load, lb/yr	Post Load, lb/yr	Post Jellyfish Load, lb/yr	Post Jellyfish & Vortechs Load, lb/yr	Post Jellyfish, Vortechs and Infiltration, lb/yr	Post Jellyfish, Vortechs, Infiltration and Lateral Soils, lb/yr
BOD	1094	2723	271	271	197	87
TP	14.6	36.0	15.5	10.2	8	1.4
TN	163	345	182	170	126	29
TSS	7315	11380	2203	2072	1670	1069
Lead	5.2	13	2.6	2.1	1.4	0.30
Copper	4.3	10	1.4	1.3	0.9	0.36
Zinc	5.1	12	3.8	3.0	1.9	0.39
Oil&Grease	206.8	475	187	73	53	13
						23

\*- In response to comments, the applicant has assumed a 50% reduction in both the infiltration and lateral soil pollutant removal rates used in the FEIS.









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### **Appendix D**

Peak Discharge Rates Comparison Table, NRCC (2011) vs. TP-40 Rainfall Data

#### **HydroCAD Printouts:**

NRCC Pre-Development Computation Summary, 1- through 100-Year Storm

NRCC Post-Development Computation Summary, 1- through 100-Year Storm

NRCC Post-Development 50- & 100-Year Pond Routings with Added Detention Storage

NRCC Post-Development 1-Year Subsurface Infiltration System Summary

Figure 1 - Additional Flood Storage for NRCC 50 & 100 Year Post Development Storms

**Costco Wholesale - Yorktown, NY**

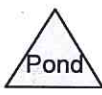
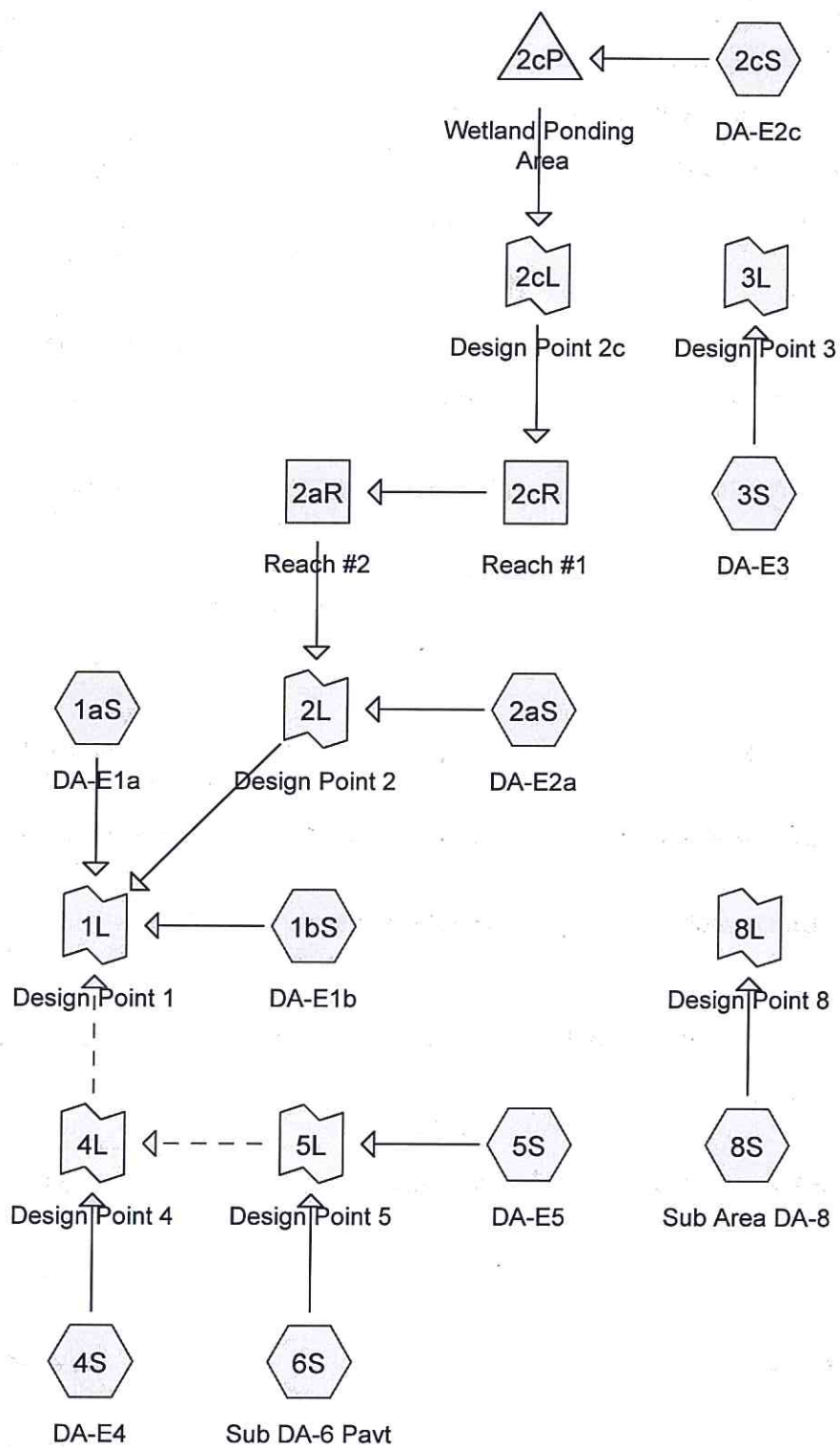
**Peak Discharge Rate Comparison Table - NRCC (2011) vs. TP-40 Rainfall Data**

Design Storm & Rainfall Values	Design Point	Pre-Development Conditions - NRCC (cfs)	Post-Development Conditions - NRCC (cfs)	% Dec. (-) / Inc. (+)	Pre-Development Conditions - TP-40 (cfs)	Post-Development Conditions - TP-40 (cfs)	% Dec. (-) / Inc. (+)
1	1	1.06	0.80	-25%	1.78	1.23	-31%
2.77" (NRCC)	2	0.74	0.46	-38%	1.24	0.73	-41%
3.0" (TP-40)	3	1.51	0.01	-99%	2.00	0.03	-99%
	4	2.45	0.59	-76%	2.94	0.63	-79%
	5 (Note 7)	2.66	0.00	-100%	2.50	0.00	-100%
2	1	2.58	1.91	-26%	3.22	2.28	-29%
3.37" (NRCC)	2	1.82	1.15	-37%	2.27	1.40	-38%
3.5" (TP-40)	3	2.67	0.05	-98%	3.04	0.08	-97%
	4	3.81	0.83	-78%	4.15	0.82	-80%
	5 (Note 7)	3.20	0.23	-93%	2.96	0.20	-93%
10	1	8.32	5.87	-29%	9.10	6.42	-29%
5.09" (NRCC)	2	5.88	3.51	-40%	6.43	3.96	-38%
5.0" (TP-40)	3	6.17	2.08	-66%	6.73	4.31	-36%
	4	7.61	1.41	-81%	8.20	1.44	-82%
	5 (Note 7)	4.33	0.73	-83%	4.31	0.80	-81%
25	1	14.20	9.38	-34%	14.16	9.69	-32%
6.44" (NRCC)	2	11.43	6.42	-44%	11.41	6.77	-41%
6.0" (TP-40)	3	9.13	6.20	-32%	9.48	7.35	-22%
	4	10.71	1.86	-83%	11.17	1.86	-83%
	5 (Note 7)	5.23	1.13	-78%	5.21	1.20	-77%
50	1	24.57	14.38	-41%	23.74	16.54	-30%
7.70" (NRCC)	2	20.06	11.65	-42%	19.37	15.31	-21%
7.0" (TP-40)	3	11.84	8.96	-24%	12.37	11.04	-11%
	4	13.44	2.24	-83%	14.20	2.29	-84%
	5 (Note 7)	5.97	1.45	-76%	6.11	1.60	-74%
100	1	38.36	29.59	-23%	28.71	25.73	-10%
9.23" (NRCC)	2	31.68	26.86	-15%	23.51	23.22	-1%
7.5" (TP-40)	3	15.14	14.67	-3%	13.85	12.96	-6%
	4	16.81	2.70	-84%	15.73	2.51	-84%
	5 (Note 7)	6.87	1.85	-73%	6.55	1.80	-73%

**Notes:**

- Design Point 1: Offsite location where stream discharges to existing culvert under Old Crompond Road.
- Design Point 2: Location where stream discharges from the site.
- Design Point 2c: Point of discharge from Wetland A pond/vernal pool.
- Design Point 3: Location where site runoff discharges from site at north property line.
- Design Point 4: Location where site runoff discharges to existing culvert at Old Crompond Road.
- Design Point 5: Location where existing site runoff discharges to existing storm drain in NYS Route 35/U.S. Route 202. Incorporated into Design Point 2 (DA-ES is incorporated into DA-P2b-1) under post-development conditions.
- Under proposed condition, DA-5 is incorporated into DA-2b1, which drains to DP-2.





Routing Diagram for Nov 2014\_Pre-Dev Calculations\_NRCC Rainfall  
 Prepared by TRC, Printed 12/4/2014  
 HydroCAD® 10.00-13 s/n 06251 © 2014 HydroCAD Software Solutions LLC

Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=0.20" Tc=11.8 min CN=58 Runoff=0.07 cfs 0.020 af
<b>Subcatchment 1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=0.41" Tc=12.1 min CN=65 Runoff=0.35 cfs 0.048 af
<b>Subcatchment 2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=0.31" Tc=20.1 min CN=62 Runoff=0.74 cfs 0.161 af
<b>Subcatchment 2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=0.28" Tc=12.4 min CN=61 Runoff=0.53 cfs 0.112 af
<b>Subcatchment 3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=0.55" Tc=19.7 min CN=69 Runoff=1.51 cfs 0.205 af
<b>Subcatchment 4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=0.77" Tc=16.1 min CN=74 Runoff=2.45 cfs 0.260 af
<b>Subcatchment 5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=2.23" Tc=6.0 min CN=95 Runoff=1.75 cfs 0.115 af
<b>Subcatchment 6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=2.54" Tc=6.0 min CN=98 Runoff=0.91 cfs 0.063 af
<b>Subcatchment 8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=2.54" Tc=6.0 min CN=98 Runoff=1.79 cfs 0.125 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.030 L=385.0' S=0.0156 ' Capacity=1,270.26 cfs Outflow=0.00 cfs 0.000 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.030 L=140.0' S=0.0268 ' Capacity=6,174.96 cfs Outflow=0.00 cfs 0.000 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.65' Storage=4,884 cf Inflow=0.53 cfs 0.112 af Outflow=0.00 cfs 0.000 af
<b>Link 1L: Design Point 1</b>	Inflow=1.06 cfs 0.229 af Primary=1.06 cfs 0.229 af
<b>Link 2cL: Design Point 2c</b>	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
<b>Link 2L: Design Point 2</b>	Inflow=0.74 cfs 0.161 af Primary=0.74 cfs 0.161 af
<b>Link 3L: Design Point 3</b>	Inflow=1.51 cfs 0.205 af Primary=1.51 cfs 0.205 af



**Link 4L: Design Point 4**

below 25.00 cfs Inflow=2.45 cfs 0.260 af  
Primary=2.45 cfs 0.260 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=2.66 cfs 0.178 af  
Primary=2.66 cfs 0.178 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=1.79 cfs 0.125 af  
Primary=1.79 cfs 0.125 af

**Nov 2014\_Pre-Dev Calculations\_NRCC Rainfall NY-Yorktown 24-hr S1 2-yr Rainfall=3.37"**

Prepared by TRC

Printed 12/4/2014

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Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=0.40" Tc=11.8 min CN=58 Runoff=0.22 cfs 0.039 af
<b>Subcatchment1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=0.68" Tc=12.1 min CN=65 Runoff=0.74 cfs 0.082 af
<b>Subcatchment2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=0.56" Tc=20.1 min CN=62 Runoff=1.82 cfs 0.288 af
<b>Subcatchment2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=0.52" Tc=12.4 min CN=61 Runoff=1.50 cfs 0.205 af
<b>Subcatchment3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=0.88" Tc=19.7 min CN=69 Runoff=2.67 cfs 0.326 af
<b>Subcatchment4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=1.15" Tc=16.1 min CN=74 Runoff=3.81 cfs 0.391 af
<b>Subcatchment5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=2.81" Tc=6.0 min CN=95 Runoff=2.12 cfs 0.145 af
<b>Subcatchment6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=3.14" Tc=6.0 min CN=98 Runoff=1.08 cfs 0.078 af
<b>Subcatchment8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=3.14" Tc=6.0 min CN=98 Runoff=2.13 cfs 0.154 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.01' Max Vel=0.53 fps Inflow=0.12 cfs 0.061 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=0.12 cfs 0.061 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.01' Max Vel=1.21 fps Inflow=0.12 cfs 0.061 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=0.12 cfs 0.061 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.76' Storage=6,489 cf Inflow=1.50 cfs 0.205 af Outflow=0.12 cfs 0.061 af
<b>Link 1L: Design Point 1</b>	Inflow=2.58 cfs 0.469 af Primary=2.58 cfs 0.469 af
<b>Link 2cL: Design Point 2c</b>	Inflow=0.12 cfs 0.061 af Primary=0.12 cfs 0.061 af
<b>Link 2L: Design Point 2</b>	Inflow=1.82 cfs 0.349 af Primary=1.82 cfs 0.349 af
<b>Link 3L: Design Point 3</b>	Inflow=2.67 cfs 0.326 af Primary=2.67 cfs 0.326 af



**Link 4L: Design Point 4**

below 25.00 cfs Inflow=3.81 cfs 0.391 af  
Primary=3.81 cfs 0.391 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=3.20 cfs 0.224 af  
Primary=3.20 cfs 0.224 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=2.13 cfs 0.154 af  
Primary=2.13 cfs 0.154 af

Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=1.22" Tc=11.8 min CN=58 Runoff=1.04 cfs 0.118 af
<b>Subcatchment 1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=1.71" Tc=12.1 min CN=65 Runoff=1.99 cfs 0.204 af
<b>Subcatchment 2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=1.49" Tc=20.1 min CN=62 Runoff=5.88 cfs 0.773 af
<b>Subcatchment 2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=1.42" Tc=12.4 min CN=61 Runoff=5.21 cfs 0.566 af
<b>Subcatchment 3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=2.02" Tc=19.7 min CN=69 Runoff=6.17 cfs 0.752 af
<b>Subcatchment 4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=2.44" Tc=16.1 min CN=74 Runoff=7.61 cfs 0.828 af
<b>Subcatchment 5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=4.51" Tc=6.0 min CN=95 Runoff=2.89 cfs 0.233 af
<b>Subcatchment 6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=4.85" Tc=6.0 min CN=98 Runoff=1.44 cfs 0.121 af
<b>Subcatchment 8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=4.85" Tc=6.0 min CN=98 Runoff=2.83 cfs 0.239 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.05' Max Vel=0.81 fps Inflow=1.31 cfs 0.422 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=1.24 cfs 0.422 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.07' Max Vel=1.44 fps Inflow=1.31 cfs 0.422 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=1.31 cfs 0.422 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.86' Storage=8,425 cf Inflow=5.21 cfs 0.566 af Outflow=1.31 cfs 0.422 af
<b>Link 1L: Design Point 1</b>	Inflow=8.32 cfs 1.517 af Primary=8.32 cfs 1.517 af
<b>Link 2cL: Design Point 2c</b>	Inflow=1.31 cfs 0.422 af Primary=1.31 cfs 0.422 af
<b>Link 2L: Design Point 2</b>	Inflow=5.88 cfs 1.195 af Primary=5.88 cfs 1.195 af
<b>Link 3L: Design Point 3</b>	Inflow=6.17 cfs 0.752 af Primary=6.17 cfs 0.752 af



**Nov 2014\_Pre-Dev Calculations\_NRCC Rainfall***NY-Yorktown 24-hr S1 10-yr Rainfall=5.09"*

Prepared by TRC

Printed 12/4/2014

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**Link 4L: Design Point 4**

below 25.00 cfs Inflow=7.61 cfs 0.828 af  
Primary=7.61 cfs 0.828 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=4.33 cfs 0.354 af  
Primary=4.33 cfs 0.354 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=2.83 cfs 0.239 af  
Primary=2.83 cfs 0.239 af

Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=2.04" Tc=11.8 min CN=58 Runoff=1.82 cfs 0.197 af
<b>Subcatchment 1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=2.68" Tc=12.1 min CN=65 Runoff=3.08 cfs 0.319 af
<b>Subcatchment 2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=2.40" Tc=20.1 min CN=62 Runoff=9.55 cfs 1.240 af
<b>Subcatchment 2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=2.31" Tc=12.4 min CN=61 Runoff=8.57 cfs 0.916 af
<b>Subcatchment 3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=3.06" Tc=19.7 min CN=69 Runoff=9.13 cfs 1.137 af
<b>Subcatchment 4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=3.56" Tc=16.1 min CN=74 Runoff=10.71 cfs 1.210 af
<b>Subcatchment 5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=5.85" Tc=6.0 min CN=95 Runoff=3.50 cfs 0.302 af
<b>Subcatchment 6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=6.20" Tc=6.0 min CN=98 Runoff=1.73 cfs 0.155 af
<b>Subcatchment 8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=6.20" Tc=6.0 min CN=98 Runoff=3.40 cfs 0.305 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.10' Max Vel=1.29 fps Inflow=4.35 cfs 0.773 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=4.18 cfs 0.773 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.15' Max Vel=2.21 fps Inflow=4.34 cfs 0.773 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=4.35 cfs 0.773 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.97' Storage=10,511 cf Inflow=8.57 cfs 0.916 af Outflow=4.34 cfs 0.773 af
<b>Link 1L: Design Point 1</b>	Inflow=14.20 cfs 2.529 af Primary=14.20 cfs 2.529 af
<b>Link 2cL: Design Point 2c</b>	Inflow=4.34 cfs 0.773 af Primary=4.34 cfs 0.773 af
<b>Link 2L: Design Point 2</b>	Inflow=11.43 cfs 2.013 af Primary=11.43 cfs 2.013 af
<b>Link 3L: Design Point 3</b>	Inflow=9.13 cfs 1.137 af Primary=9.13 cfs 1.137 af



**Link 4L: Design Point 4**

below 25.00 cfs Inflow=10.71 cfs 1.210 af  
Primary=10.71 cfs 1.210 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=5.23 cfs 0.457 af  
Primary=5.23 cfs 0.457 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=3.40 cfs 0.305 af  
Primary=3.40 cfs 0.305 af

Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=2.90" Tc=11.8 min CN=58 Runoff=2.60 cfs 0.280 af
<b>Subcatchment 1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=3.65" Tc=12.1 min CN=65 Runoff=4.13 cfs 0.435 af
<b>Subcatchment 2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=3.33" Tc=20.1 min CN=62 Runoff=13.03 cfs 1.721 af
<b>Subcatchment 2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=3.22" Tc=12.4 min CN=61 Runoff=11.75 cfs 1.279 af
<b>Subcatchment 3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=4.10" Tc=19.7 min CN=69 Runoff=11.84 cfs 1.522 af
<b>Subcatchment 4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=4.66" Tc=16.1 min CN=74 Runoff=13.44 cfs 1.584 af
<b>Subcatchment 5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=7.10" Tc=6.0 min CN=95 Runoff=4.00 cfs 0.367 af
<b>Subcatchment 6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=7.46" Tc=6.0 min CN=98 Runoff=1.96 cfs 0.187 af
<b>Subcatchment 8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=7.46" Tc=6.0 min CN=98 Runoff=3.86 cfs 0.367 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.14' Max Vel=1.65 fps Inflow=8.06 cfs 1.135 af n=0.030 L=385.0' S=0.0156 ' Capacity=1,270.26 cfs Outflow=7.84 cfs 1.135 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.22' Max Vel=2.73 fps Inflow=8.05 cfs 1.135 af n=0.030 L=140.0' S=0.0268 ' Capacity=6,174.96 cfs Outflow=8.06 cfs 1.135 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=394.05' Storage=12,416 cf Inflow=11.75 cfs 1.279 af Outflow=8.05 cfs 1.135 af
<b>Link 1L: Design Point 1</b>	Inflow=24.57 cfs 3.572 af Primary=24.57 cfs 3.572 af
<b>Link 2cL: Design Point 2c</b>	Inflow=8.05 cfs 1.135 af Primary=8.05 cfs 1.135 af
<b>Link 2L: Design Point 2</b>	Inflow=20.06 cfs 2.856 af Primary=20.06 cfs 2.856 af
<b>Link 3L: Design Point 3</b>	Inflow=11.84 cfs 1.522 af Primary=11.84 cfs 1.522 af



**Link 4L: Design Point 4**

below 25.00 cfs Inflow=13.44 cfs 1.584 af  
Primary=13.44 cfs 1.584 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=5.97 cfs 0.553 af  
Primary=5.97 cfs 0.553 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=3.86 cfs 0.367 af  
Primary=3.86 cfs 0.367 af

Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment1aS: DA-E1a</b>	Runoff Area=1.160 ac 3.45% Impervious Runoff Depth=4.03" Tc=11.8 min CN=58 Runoff=3.56 cfs 0.390 af
<b>Subcatchment1bS: DA-E1b</b>	Runoff Area=1.430 ac 13.99% Impervious Runoff Depth=4.91" Tc=12.1 min CN=65 Runoff=5.38 cfs 0.585 af
<b>Subcatchment2aS: DA-E2a</b>	Runoff Area=6.210 ac 6.44% Impervious Runoff Depth=4.53" Tc=20.1 min CN=62 Runoff=17.38 cfs 2.346 af
<b>Subcatchment2cS: DA-E2c</b>	Runoff Area=4.770 ac 0.21% Impervious Runoff Depth=4.41" Tc=12.4 min CN=61 Runoff=15.73 cfs 1.752 af
<b>Subcatchment3S: DA-E3</b>	Runoff Area=4.460 ac 27.58% Impervious Runoff Depth=5.41" Tc=19.7 min CN=69 Runoff=15.14 cfs 2.012 af
<b>Subcatchment4S: DA-E4</b>	Runoff Area=4.080 ac 17.89% Impervious Runoff Depth=6.04" Tc=16.1 min CN=74 Runoff=16.81 cfs 2.053 af
<b>Subcatchment5S: DA-E5</b>	Runoff Area=0.620 ac 90.32% Impervious Runoff Depth=8.63" Tc=6.0 min CN=95 Runoff=4.62 cfs 0.446 af
<b>Subcatchment6S: Sub DA-6 Pavt</b>	Runoff Area=0.300 ac 100.00% Impervious Runoff Depth=8.99" Tc=6.0 min CN=98 Runoff=2.26 cfs 0.225 af
<b>Subcatchment8S: Sub Area DA-8</b>	Runoff Area=0.590 ac 100.00% Impervious Runoff Depth=8.99" Tc=6.0 min CN=98 Runoff=4.44 cfs 0.442 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.20' Max Vel=2.06 fps Inflow=16.50 cfs 1.608 af n=0.030 L=385.0' S=0.0156 ' Capacity=1,270.26 cfs Outflow=14.30 cfs 1.608 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.33' Max Vel=3.48 fps Inflow=17.45 cfs 1.608 af n=0.030 L=140.0' S=0.0268 ' Capacity=6,174.96 cfs Outflow=16.50 cfs 1.608 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=394.20' Storage=13,483 cf Inflow=15.73 cfs 1.752 af Outflow=17.45 cfs 1.608 af
<b>Link 1L: Design Point 1</b>	Inflow=38.36 cfs 4.929 af Primary=38.36 cfs 4.929 af
<b>Link 2cL: Design Point 2c</b>	Inflow=17.45 cfs 1.608 af Primary=17.45 cfs 1.608 af
<b>Link 2L: Design Point 2</b>	Inflow=31.68 cfs 3.954 af Primary=31.68 cfs 3.954 af
<b>Link 3L: Design Point 3</b>	Inflow=15.14 cfs 2.012 af Primary=15.14 cfs 2.012 af



**Link 4L: Design Point 4**

below 25.00 cfs Inflow=16.81 cfs 2.053 af  
Primary=16.81 cfs 2.053 af Secondary=0.00 cfs 0.000 af

**Link 5L: Design Point 5**

below 16.00 cfs Inflow=6.87 cfs 0.670 af  
Primary=6.87 cfs 0.670 af Secondary=0.00 cfs 0.000 af

**Link 8L: Design Point 8**

Inflow=4.44 cfs 0.442 af  
Primary=4.44 cfs 0.442 af





Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=0.23" Tc=11.8 min CN=59 Runoff=0.08 cfs 0.022 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=0.55" Tc=6.0 min CN=69 Runoff=0.46 cfs 0.038 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=0.34" Tc=11.7 min CN=63 Runoff=0.46 cfs 0.076 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=2.13" Flow Length=932' Tc=11.1 min CN=94 Runoff=18.71 cfs 1.511 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=2.03" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=11.19 cfs 0.866 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=0.31" Tc=12.4 min CN=62 Runoff=0.51 cfs 0.096 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=0.14" Tc=23.1 min CN=55 Runoff=0.01 cfs 0.006 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=1.14" Tc=8.2 min CN=81 Runoff=0.59 cfs 0.043 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=2.43" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=1.22 cfs 0.083 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=2.33" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=2.53 cfs 0.169 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=0.00 cfs 0.000 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=0.00 cfs 0.000 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=426.84' Storage=70,575 cf Inflow=32.54 cfs 2.629 af Discarded=0.74 cfs 2.630 af Primary=0.00 cfs 0.000 af Outflow=0.74 cfs 2.630 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=425.00' Storage=0 cf Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.60' Storage=4,196 cf Inflow=0.51 cfs 0.096 af Outflow=0.00 cfs 0.000 af
<b>Link 1L: Design Point 1</b>	Inflow=0.80 cfs 0.136 af Primary=0.80 cfs 0.136 af

<b>Link 2cL: Design Point 2c</b>	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
<b>Link 2L: Design Point 2</b>	Inflow=0.46 cfs 0.076 af Primary=0.46 cfs 0.076 af
<b>Link 3L: Design Point 3</b>	Inflow=0.01 cfs 0.006 af Primary=0.01 cfs 0.006 af
<b>Link 4L: Design Point 4</b>	below 25.00 cfs Inflow=0.59 cfs 0.043 af Primary=0.59 cfs 0.043 af Secondary=0.00 cfs 0.000 af
<b>Link 5L: Design Point 5</b>	below 16.00 cfs Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af
<b>Link 8L: Design Point 8</b>	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
<b>Link SG-1L: StormGate-2b1</b>	below 21.35 cfs Inflow=21.35 cfs 1.763 af Primary=21.35 cfs 1.763 af Secondary=0.00 cfs 0.000 af
<b>Link SG-2L: StormGate-2b2</b>	below 11.19 cfs Inflow=11.19 cfs 0.866 af Primary=11.19 cfs 0.866 af Secondary=0.00 cfs 0.000 af
<b>Link SG-3L: StormGate-6</b>	below 1.22 cfs Inflow=1.22 cfs 0.083 af Primary=1.22 cfs 0.083 af Secondary=0.00 cfs 0.000 af
<b>Link SG-4L: StormGate-8</b>	below 2.53 cfs Inflow=2.53 cfs 0.169 af Primary=2.53 cfs 0.169 af Secondary=0.00 cfs 0.000 af



**Nov 2014\_Post-Dev\_NRCC Rainfall-Add Storage** NY-Yorktown 24-hr S1 2-yr Rainfall=3.37"

Prepared by TRC

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Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=0.44" Tc=11.8 min CN=59 Runoff=0.26 cfs 0.042 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=0.88" Tc=6.0 min CN=69 Runoff=0.80 cfs 0.060 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=0.60" Tc=11.7 min CN=63 Runoff=1.13 cfs 0.134 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=2.71" Flow Length=932' Tc=11.1 min CN=94 Runoff=22.91 cfs 1.923 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=2.61" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=13.81 cfs 1.111 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=0.56" Tc=12.4 min CN=62 Runoff=1.34 cfs 0.172 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=0.30" Tc=23.1 min CN=55 Runoff=0.05 cfs 0.014 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=1.60" Tc=8.2 min CN=81 Runoff=0.83 cfs 0.060 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=3.03" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=1.46 cfs 0.103 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=2.92" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=3.04 cfs 0.211 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.01' Max Vel=0.53 fps Inflow=0.23 cfs 0.080 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=0.18 cfs 0.080 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.02' Max Vel=1.21 fps Inflow=0.23 cfs 0.080 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=0.23 cfs 0.080 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=429.51' Storage=94,564 cf Inflow=32.54 cfs 3.293 af Discarded=0.74 cfs 3.294 af Primary=0.00 cfs 0.000 af Outflow=0.74 cfs 3.294 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=425.30' Storage=2,238 cf Inflow=7.33 cfs 0.053 af Primary=0.23 cfs 0.052 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=0.23 cfs 0.052 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.76' Storage=6,418 cf Inflow=1.34 cfs 0.172 af Outflow=0.08 cfs 0.028 af
<b>Link 1L: Design Point 1</b>	Inflow=1.91 cfs 0.316 af Primary=1.91 cfs 0.316 af

Link 2cL: Design Point 2c Inflow=0.08 cfs 0.028 af  
Primary=0.08 cfs 0.028 af

Link 2L: Design Point 2 Inflow=1.15 cfs 0.214 af  
Primary=1.15 cfs 0.214 af

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Link 3L: Design Point 3 Inflow=0.05 cfs 0.014 af  
Primary=0.05 cfs 0.014 af

Link 4L: Design Point 4 below 25.00 cfs Inflow=0.83 cfs 0.060 af  
Primary=0.83 cfs 0.060 af Secondary=0.00 cfs 0.000 af

Link 5L: Design Point 5 below 16.00 cfs Inflow=0.23 cfs 0.001 af  
Primary=0.23 cfs 0.001 af Secondary=0.00 cfs 0.000 af

Link 8L: Design Point 8 Inflow=0.48 cfs 0.003 af  
Primary=0.48 cfs 0.003 af

Link SG-1L: StormGate-2b1 below 21.35 cfs Inflow=26.07 cfs 2.235 af  
Primary=21.35 cfs 2.200 af Secondary=4.72 cfs 0.034 af

Link SG-2L: StormGate-2b2 below 11.19 cfs Inflow=13.81 cfs 1.111 af  
Primary=11.19 cfs 1.093 af Secondary=2.62 cfs 0.018 af

Link SG-3L: StormGate-6 below 1.22 cfs Inflow=1.46 cfs 0.103 af  
Primary=1.29 cfs 0.102 af Secondary=0.23 cfs 0.001 af

Link SG-4L: StormGate-8 below 2.53 cfs Inflow=3.04 cfs 0.211 af  
Primary=2.67 cfs 0.209 af Secondary=0.48 cfs 0.003 af



Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=1.29" Tc=11.8 min CN=59 Runoff=1.10 cfs 0.122 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=2.02" Tc=6.0 min CN=69 Runoff=1.80 cfs 0.138 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=1.57" Tc=11.7 min CN=63 Runoff=3.39 cfs 0.351 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=4.40" Flow Length=932' Tc=11.1 min CN=94 Runoff=32.05 cfs 3.122 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=4.29" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=19.53 cfs 1.825 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=1.49" Tc=12.4 min CN=62 Runoff=4.33 cfs 0.463 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=1.03" Tc=23.1 min CN=55 Runoff=0.29 cfs 0.047 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=3.06" Tc=8.2 min CN=81 Runoff=1.41 cfs 0.115 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=4.74" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=1.95 cfs 0.162 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=4.62" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=4.11 cfs 0.335 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.06' Max Vel=0.95 fps Inflow=1.83 cfs 1.333 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=1.83 cfs 1.333 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.09' Max Vel=1.64 fps Inflow=1.83 cfs 1.333 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=1.83 cfs 1.333 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=432.25' Storage=119,276 cf Inflow=32.54 cfs 5.156 af Discarded=0.74 cfs 3.929 af Primary=4.50 cfs 1.227 af Outflow=5.24 cfs 5.156 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=426.79' Storage=14,374 cf Inflow=22.72 cfs 1.496 af Primary=1.17 cfs 1.014 af Secondary=2.02 cfs 0.482 af Tertiary=0.00 cfs 0.000 af Outflow=3.20 cfs 1.495 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.83' Storage=7,730 cf Inflow=4.33 cfs 0.463 af Outflow=0.78 cfs 0.319 af
<b>Link 1L: Design Point 1</b>	Inflow=5.87 cfs 1.945 af Primary=5.87 cfs 1.945 af

Link 2cL: Design Point 2c Inflow=0.78 cfs 0.319 af  
 Primary=0.78 cfs 0.319 af

Link 2L: Design Point 2 Inflow=3.51 cfs 1.684 af  
 Primary=3.51 cfs 1.684 af

Link 3L: Design Point 3 Inflow=2.08 cfs 0.529 af  
 Primary=2.08 cfs 0.529 af

Link 4L: Design Point 4 below 25.00 cfs Inflow=1.41 cfs 0.115 af  
 Primary=1.41 cfs 0.115 af Secondary=0.00 cfs 0.000 af

Link 5L: Design Point 5 below 16.00 cfs Inflow=0.73 cfs 0.006 af  
 Primary=0.73 cfs 0.006 af Secondary=0.00 cfs 0.000 af

Link 8L: Design Point 8 Inflow=1.58 cfs 0.013 af  
 Primary=1.58 cfs 0.013 af

Link SG-1L: StormGate-2b1 below 21.35 cfs Inflow=35.78 cfs 3.600 af  
 Primary=21.35 cfs 3.428 af Secondary=14.43 cfs 0.172 af

Link SG-2L: StormGate-2b2 below 11.19 cfs Inflow=19.53 cfs 1.825 af  
 Primary=11.19 cfs 1.728 af Secondary=8.34 cfs 0.097 af

Link SG-3L: StormGate-6 below 1.22 cfs Inflow=1.95 cfs 0.162 af  
 Primary=1.22 cfs 0.156 af Secondary=0.73 cfs 0.006 af

Link SG-4L: StormGate-8 below 2.53 cfs Inflow=4.11 cfs 0.335 af  
 Primary=2.53 cfs 0.322 af Secondary=1.58 cfs 0.013 af



Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=2.13" Tc=11.8 min CN=59 Runoff=1.91 cfs 0.202 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=3.06" Tc=6.0 min CN=69 Runoff=2.64 cfs 0.209 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=2.49" Tc=11.7 min CN=63 Runoff=5.46 cfs 0.558 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=5.73" Flow Length=932' Tc=11.1 min CN=94 Runoff=39.16 cfs 4.070 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=5.62" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=23.95 cfs 2.392 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=2.40" Tc=12.4 min CN=62 Runoff=7.00 cfs 0.743 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=1.78" Tc=23.1 min CN=55 Runoff=0.55 cfs 0.081 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=4.29" Tc=8.2 min CN=81 Runoff=1.86 cfs 0.161 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=6.08" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=2.35 cfs 0.208 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=5.97" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=4.96 cfs 0.433 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.10' Max Vel=1.33 fps Inflow=4.54 cfs 1.932 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=4.51 cfs 1.932 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.15' Max Vel=2.24 fps Inflow=4.54 cfs 1.932 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=4.54 cfs 1.932 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=432.94' Storage=125,468 cf Inflow=32.54 cfs 6.568 af Discarded=0.74 cfs 3.994 af Primary=19.07 cfs 2.575 af Outflow=19.81 cfs 6.569 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=429.04' Storage=36,835 cf Inflow=34.25 cfs 3.077 af Primary=1.84 cfs 1.332 af Secondary=6.03 cfs 1.743 af Tertiary=0.00 cfs 0.000 af Outflow=7.87 cfs 3.075 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=393.93' Storage=9,680 cf Inflow=7.00 cfs 0.743 af Outflow=2.95 cfs 0.599 af
<b>Link 1L: Design Point 1</b>	Inflow=9.38 cfs 2.901 af Primary=9.38 cfs 2.901 af

Link 2cL: Design Point 2c Inflow=2.95 cfs 0.599 af  
Primary=2.95 cfs 0.599 af

Link 2L: Design Point 2 Inflow=6.42 cfs 2.490 af  
Primary=6.42 cfs 2.490 af

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Link 3L: Design Point 3 Inflow=6.20 cfs 1.825 af  
Primary=6.20 cfs 1.825 af

Link 4L: Design Point 4 below 25.00 cfs Inflow=1.86 cfs 0.161 af  
Primary=1.86 cfs 0.161 af Secondary=0.00 cfs 0.000 af

Link 5L: Design Point 5 below 16.00 cfs Inflow=1.13 cfs 0.010 af  
Primary=1.13 cfs 0.010 af Secondary=0.00 cfs 0.000 af

Link 8L: Design Point 8 Inflow=2.43 cfs 0.023 af  
Primary=2.43 cfs 0.023 af

Link SG-1L: StormGate-2b1 below 21.35 cfs Inflow=42.91 cfs 4.678 af  
Primary=21.35 cfs 4.358 af Secondary=21.56 cfs 0.320 af

Link SG-2L: StormGate-2b2 below 11.19 cfs Inflow=23.95 cfs 2.392 af  
Primary=11.19 cfs 2.210 af Secondary=12.76 cfs 0.182 af

Link SG-3L: StormGate-6 below 1.22 cfs Inflow=2.35 cfs 0.208 af  
Primary=1.22 cfs 0.197 af Secondary=1.13 cfs 0.010 af

Link SG-4L: StormGate-8 below 2.53 cfs Inflow=4.96 cfs 0.433 af  
Primary=2.53 cfs 0.410 af Secondary=2.43 cfs 0.023 af



Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=3.00" Tc=11.8 min CN=59 Runoff=2.67 cfs 0.285 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=4.10" Tc=6.0 min CN=69 Runoff=3.38 cfs 0.280 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=3.43" Tc=11.7 min CN=63 Runoff=7.35 cfs 0.770 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=6.98" Flow Length=932' Tc=11.1 min CN=94 Runoff=45.06 cfs 4.958 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=6.87" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=27.61 cfs 2.923 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=3.33" Tc=12.4 min CN=62 Runoff=9.51 cfs 1.031 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=2.58" Tc=23.1 min CN=55 Runoff=0.80 cfs 0.118 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=5.46" Tc=8.2 min CN=81 Runoff=2.24 cfs 0.205 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=7.34" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=2.67 cfs 0.251 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=7.22" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=5.65 cfs 0.524 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.14' Max Vel=1.64 fps Inflow=7.96 cfs 2.551 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=7.83 cfs 2.551 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.21' Max Vel=2.72 fps Inflow=7.98 cfs 2.551 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=7.96 cfs 2.551 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=433.55' Storage=130,965 cf Inflow=32.54 cfs 7.874 af Discarded=0.74 cfs 4.031 af Primary=27.79 cfs 3.844 af Outflow=28.53 cfs 7.875 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=431.44' Storage=67,098 cf Inflow=53.82 cfs 4.577 af Primary=4.50 cfs 1.664 af Secondary=8.64 cfs 2.912 af Tertiary=0.00 cfs 0.000 af Outflow=13.14 cfs 4.576 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=394.01' Storage=11,323 cf Inflow=9.51 cfs 1.031 af Outflow=6.02 cfs 0.887 af
<b>Link 1L: Design Point 1</b>	Inflow=14.38 cfs 3.886 af Primary=14.38 cfs 3.886 af

Link 2cL: Design Point 2c Inflow=6.02 cfs 0.887 af  
Primary=6.02 cfs 0.887 af

Link 2L: Design Point 2 Inflow=11.65 cfs 3.321 af  
Primary=11.65 cfs 3.321 af

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Link 3L: Design Point 3 Inflow=8.96 cfs 3.030 af  
Primary=8.96 cfs 3.030 af

Link 4L: Design Point 4 below 25.00 cfs Inflow=2.24 cfs 0.205 af  
Primary=2.24 cfs 0.205 af Secondary=0.00 cfs 0.000 af

Link 5L: Design Point 5 below 16.00 cfs Inflow=1.45 cfs 0.015 af  
Primary=1.45 cfs 0.015 af Secondary=0.00 cfs 0.000 af

Link 8L: Design Point 8 Inflow=3.12 cfs 0.034 af  
Primary=3.12 cfs 0.034 af

Link SG-1L: StormGate-2b1 below 21.35 cfs Inflow=48.81 cfs 5.684 af  
Primary=21.35 cfs 5.216 af Secondary=27.46 cfs 0.468 af

Link SG-2L: StormGate-2b2 below 11.19 cfs Inflow=27.61 cfs 2.923 af  
Primary=11.19 cfs 2.658 af Secondary=16.42 cfs 0.265 af

Link SG-3L: StormGate-6 below 1.22 cfs Inflow=2.67 cfs 0.251 af  
Primary=1.22 cfs 0.235 af Secondary=1.45 cfs 0.015 af

Link SG-4L: StormGate-8 below 2.53 cfs Inflow=5.65 cfs 0.524 af  
Primary=2.53 cfs 0.490 af Secondary=3.12 cfs 0.034 af



Time span=0.00-120.00 hrs, dt=0.05 hrs, 2401 points x 3  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 1aS: DA-P1a</b>	Runoff Area=1.140 ac 4.39% Impervious Runoff Depth=4.16" Tc=11.8 min CN=59 Runoff=3.62 cfs 0.395 af
<b>Subcatchment 1bS: DA-P1b</b>	Runoff Area=0.820 ac 12.20% Impervious Runoff Depth=5.41" Tc=6.0 min CN=69 Runoff=4.28 cfs 0.370 af
<b>Subcatchment 2aS: DA-P2a</b>	Runoff Area=2.690 ac 0.00% Impervious Runoff Depth=4.66" Tc=11.7 min CN=63 Runoff=9.71 cfs 1.044 af
<b>Subcatchment 2b-1S: DA-P2b-1</b>	Runoff Area=8.520 ac 84.27% Impervious Runoff Depth=8.51" Flow Length=932' Tc=11.1 min CN=94 Runoff=52.21 cfs 6.039 af
<b>Subcatchment 2b-2S: DA-P2b-2</b>	Runoff Area=5.110 ac 85.32% Impervious Runoff Depth=8.38" Flow Length=1,033' Tc=10.2 min CN=93 Runoff=32.05 cfs 3.570 af
<b>Subcatchment 2cS: DA-P2c</b>	Runoff Area=3.720 ac 0.00% Impervious Runoff Depth=4.53" Tc=12.4 min CN=62 Runoff=12.64 cfs 1.405 af
<b>Subcatchment 3S: DA-P3</b>	Runoff Area=0.550 ac 0.00% Impervious Runoff Depth=3.66" Tc=23.1 min CN=55 Runoff=1.14 cfs 0.168 af
<b>Subcatchment 4S: DA-P4</b>	Runoff Area=0.450 ac 31.11% Impervious Runoff Depth=6.91" Tc=8.2 min CN=81 Runoff=2.70 cfs 0.259 af
<b>Subcatchment 6S: Sub DA-6</b>	Runoff Area=0.410 ac 97.56% Impervious Runoff Depth=8.87" Flow Length=469' Slope=0.0720 '/' Tc=6.0 min CN=97 Runoff=3.07 cfs 0.303 af
<b>Subcatchment 8S: Sub DA-8</b>	Runoff Area=0.870 ac 93.10% Impervious Runoff Depth=8.75" Flow Length=618' Slope=0.0220 '/' Tc=6.0 min CN=96 Runoff=6.50 cfs 0.634 af
<b>Reach 2aR: Reach #2</b>	Avg. Flow Depth=0.27' Max Vel=2.46 fps Inflow=23.12 cfs 3.832 af n=0.030 L=385.0' S=0.0156 '/' Capacity=1,270.26 cfs Outflow=22.99 cfs 3.832 af
<b>Reach 2cR: Reach #1</b>	Avg. Flow Depth=0.40' Max Vel=3.88 fps Inflow=23.14 cfs 3.832 af n=0.030 L=140.0' S=0.0268 '/' Capacity=6,174.96 cfs Outflow=23.12 cfs 3.832 af
<b>Pond 2b-1P: Infiltration Basin/Detention</b>	Peak Elev=433.85' Storage=133,691 cf Inflow=32.54 cfs 9.416 af Discarded=0.74 cfs 4.060 af Primary=30.08 cfs 5.357 af Outflow=30.82 cfs 9.417 af
<b>Pond 2b-2P: Detention Pond</b>	Peak Elev=432.31' Storage=79,812 cf Inflow=83.17 cfs 6.417 af Primary=16.01 cfs 2.570 af Secondary=13.81 cfs 3.846 af Tertiary=0.00 cfs 0.000 af Outflow=29.82 cfs 6.416 af
<b>Pond 2cP: Wetland Ponding Area</b>	Peak Elev=394.08' Storage=13,053 cf Inflow=12.64 cfs 1.405 af Outflow=9.71 cfs 1.261 af
<b>Link 1L: Design Point 1</b>	Inflow=29.59 cfs 5.641 af Primary=29.59 cfs 5.641 af

Link 2cL: Design Point 2c Inflow=9.71 cfs 1.261 af  
 Primary=9.71 cfs 1.261 af

Link 2L: Design Point 2 Inflow=26.86 cfs 4.876 af  
 Primary=26.86 cfs 4.876 af

Link 3L: Design Point 3 Inflow=14.67 cfs 4.013 af  
 Primary=14.67 cfs 4.013 af

Link 4L: Design Point 4 below 25.00 cfs Inflow=2.70 cfs 0.259 af  
 Primary=2.70 cfs 0.259 af Secondary=0.00 cfs 0.000 af

Link 5L: Design Point 5 below 16.00 cfs Inflow=1.85 cfs 0.022 af  
 Primary=1.85 cfs 0.022 af Secondary=0.00 cfs 0.000 af

Link 8L: Design Point 8 Inflow=3.97 cfs 0.048 af  
 Primary=3.97 cfs 0.048 af

Link SG-1L: StormGate-2b1 below 21.35 cfs Inflow=55.96 cfs 6.906 af  
 Primary=21.35 cfs 6.229 af Secondary=34.61 cfs 0.677 af

Link SG-2L: StormGate-2b2 below 11.19 cfs Inflow=32.05 cfs 3.570 af  
 Primary=11.19 cfs 3.187 af Secondary=20.86 cfs 0.383 af

Link SG-3L: StormGate-6 below 1.22 cfs Inflow=3.07 cfs 0.303 af  
 Primary=1.22 cfs 0.281 af Secondary=1.85 cfs 0.022 af

Link SG-4L: StormGate-8 below 2.53 cfs Inflow=6.50 cfs 0.634 af  
 Primary=2.53 cfs 0.586 af Secondary=3.97 cfs 0.048 af



### Summary for Pond 2b-2P: Detention Pond

Inflow Area = 14.910 ac, 85.51% Impervious, Inflow Depth = 3.68" for 50-yr event  
 Inflow = 53.82 cfs @ 12.13 hrs, Volume= 4.577 af  
 Outflow = 13.14 cfs @ 12.87 hrs, Volume= 4.576 af, Atten= 76%, Lag= 44.2 min  
 Primary = 4.50 cfs @ 12.87 hrs, Volume= 1.664 af  
 Secondary = 8.64 cfs @ 12.87 hrs, Volume= 2.912 af  
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 431.44' @ 12.87 hrs Surf.Area= 14,083 sf Storage= 67,098 cf

Plug-Flow detention time= 94.9 min calculated for 4.576 af (100% of inflow)  
 Center-of-Mass det. time= 94.4 min ( 966.8 - 872.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	425.00'	59,878 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)
#2	425.00'	34,650 cf	<b>55.00'W x 70.00'L x 9.00'H Prismaoid</b>
		94,528 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
425.00	3,379	255.7	0	0	3,379
426.00	4,256	281.7	3,809	3,809	4,523
428.00	6,226	328.9	10,420	14,229	6,896
430.00	8,466	371.0	14,635	28,864	9,343
432.00	10,966	412.2	19,378	48,242	12,028
433.00	12,320	432.2	11,636	59,878	13,437

Device	Routing	Invert	Outlet Devices
#1	Primary	423.83'	<b>18.0" Round Culvert</b> L= 88.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 423.83' / 415.38' S= 0.0960 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	425.00'	<b>6.0" Vert. Orifice</b> C= 0.600
#3	Device 1	431.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	432.25'	<b>72.0" x 72.0" Horiz. Riser</b> C= 0.600 Limited to weir flow at low heads
#5	Secondary	423.65'	<b>18.0" Round Culvert</b> L= 29.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 423.65' / 421.00' S= 0.0914 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#6	Device 5	426.00'	<b>12.0" Vert. Orifice</b> C= 0.600
#7	Device 5	431.25'	<b>1.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#8	Device 5	432.25'	<b>72.0" x 72.0" Horiz. Riser</b> C= 0.600 Limited to weir flow at low heads
#9	Tertiary	432.50'	<b>137.0 deg x 10.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.48 (C= 3.10)

**Primary OutFlow** Max=4.48 cfs @ 12.87 hrs HW=431.44' TW=393.95' (Dynamic Tailwater)

- 1=Culvert (Passes 4.48 cfs of 22.28 cfs potential flow)
  - 2=Orifice (Orifice Controls 2.35 cfs @ 11.98 fps)
  - 3=Broad-Crested Rectangular Weir (Weir Controls 2.13 cfs @ 1.95 fps)
  - 4=Riser ( Controls 0.00 cfs)
- 

**Secondary OutFlow** Max=8.63 cfs @ 12.87 hrs HW=431.44' TW=0.00' (Dynamic Tailwater)

- 5=Culvert (Passes 8.63 cfs of 22.57 cfs potential flow)
- 6=Orifice (Orifice Controls 8.40 cfs @ 10.70 fps)
- 7=Broad-Crested Rectangular Weir (Weir Controls 0.23 cfs @ 1.21 fps)
- 8=Riser ( Controls 0.00 cfs)

**Tertiary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=425.00' TW=0.00' (Dynamic Tailwater)

- 9=Sharp-Crested Vee/Trap Weir ( Controls 0.00 cfs)



### Summary for Pond 2b-2P: Detention Pond

Inflow Area = 14.910 ac, 85.51% Impervious, Inflow Depth = 5.16" for 100-yr event  
 Inflow = 83.17 cfs @ 12.10 hrs, Volume= 6.417 af  
 Outflow = 29.82 cfs @ 12.50 hrs, Volume= 6.416 af, Atten= 64%, Lag= 23.8 min  
 Primary = 16.01 cfs @ 12.50 hrs, Volume= 2.570 af  
 Secondary = 13.81 cfs @ 12.50 hrs, Volume= 3.846 af  
 Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 432.31' @ 12.50 hrs Surf.Area= 15,224 sf Storage= 79,812 cf

Plug-Flow detention time= 79.3 min calculated for 6.413 af (100% of inflow)  
 Center-of-Mass det. time= 80.3 min ( 942.4 - 862.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	425.00'	59,878 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)
#2	425.00'	34,650 cf	<b>55.00'W x 70.00'L x 9.00'H Prismatoid</b>
		94,528 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
425.00	3,379	255.7	0	0	3,379
426.00	4,256	281.7	3,809	3,809	4,523
428.00	6,226	328.9	10,420	14,229	6,896
430.00	8,466	371.0	14,635	28,864	9,343
432.00	10,966	412.2	19,378	48,242	12,028
433.00	12,320	432.2	11,636	59,878	13,437

Device	Routing	Invert	Outlet Devices
#1	Primary	423.83'	<b>18.0" Round Culvert</b> L= 88.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 423.83' / 415.38' S= 0.0960 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	425.00'	<b>6.0" Vert. Orifice</b> C= 0.600
#3	Device 1	431.00'	<b>2.5' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	432.25'	<b>72.0" x 72.0" Horiz. Riser</b> C= 0.600 Limited to weir flow at low heads
#5	Secondary	423.65'	<b>18.0" Round Culvert</b> L= 29.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 423.65' / 421.00' S= 0.0914 ' / Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#6	Device 5	426.00'	<b>12.0" Vert. Orifice</b> C= 0.600
#7	Device 5	431.25'	<b>1.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#8	Device 5	432.25'	<b>72.0" x 72.0" Horiz. Riser</b> C= 0.600 Limited to weir flow at low heads
#9	Tertiary	432.50'	<b>137.0 deg x 10.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir</b> Cv= 2.48 (C= 3.10)

**Primary OutFlow** Max=16.01 cfs @ 12.50 hrs HW=432.31' TW=394.14' (Dynamic Tailwater)

- 1=Culvert (Passes 16.01 cfs of 23.65 cfs potential flow)
  - 2=Orifice (Orifice Controls 2.51 cfs @ 12.79 fps)
  - 3=Broad-Crested Rectangular Weir (Weir Controls 12.41 cfs @ 3.80 fps)
  - 4=Riser (Weir Controls 1.08 cfs @ 0.78 fps)
- 

**Secondary OutFlow** Max=13.81 cfs @ 12.50 hrs HW=432.31' TW=0.00' (Dynamic Tailwater)

- 5=Culvert (Passes 13.81 cfs of 23.93 cfs potential flow)
- 6=Orifice (Orifice Controls 9.11 cfs @ 11.60 fps)
- 7=Broad-Crested Rectangular Weir (Weir Controls 3.61 cfs @ 3.41 fps)
- 8=Riser (Weir Controls 1.08 cfs @ 0.78 fps)

**Tertiary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=425.00' TW=0.00' (Dynamic Tailwater)

- 9=Sharp-Crested Vee/Trap Weir ( Controls 0.00 cfs)
-



### Summary for Pond 2b-1P: Infiltration Basin/Detention Chambers

Inflow Area = 14.910 ac, 85.51% Impervious, Inflow Depth = 2.12" for 1-yr event  
 Inflow = 32.54 cfs @ 12.09 hrs, Volume= 2.629 af  
 Outflow = 0.74 cfs @ 10.45 hrs, Volume= 2.630 af, Atten= 98%, Lag= 0.0 min  
 Discarded = 0.74 cfs @ 10.45 hrs, Volume= 2.630 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 426.84' @ 18.99 hrs Surf.Area= 9,000 sf Storage= 70,575 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 886.3 min ( 1,690.5 - 804.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	419.00'	135,000 cf	15.00'W x 150.00'L x 15.00'H Prismatic x 4

Device	Routing	Invert	Outlet Devices
#1	Discarded	419.00'	0.74 cfs Exfiltration when above 419.00'
#2	Primary	431.75'	23.0" W x 14.0" H Ellipse Culvert X 3.00 L= 29.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 431.75' / 430.12' S= 0.0553 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.76 sf

Discarded OutFlow Max=0.74 cfs @ 10.45 hrs HW=419.16' (Free Discharge)  
 1=Exfiltration (Exfiltration Controls 0.74 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=419.00' TW=425.00' (Dynamic Tailwater)  
 2=Culvert ( Controls 0.00 cfs)

**Stage-Area-Storage for Pond 2b-1P: Infiltration Basin/Detention Chambers**

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
419.00	0	426.95	71,550
419.15	1,350	427.10	72,900
419.30	2,700	427.25	74,250
419.45	4,050	427.40	75,600
419.60	5,400	427.55	76,950
419.75	6,750	427.70	78,300
419.90	8,100	427.85	79,650
420.05	9,450	428.00	81,000
420.20	10,800	428.15	82,350
420.35	12,150	428.30	83,700
420.50	13,500	428.45	85,050
420.65	14,850	428.60	86,400
420.80	16,200	428.75	87,750
420.95	17,550	428.90	89,100
421.10	18,900	429.05	90,450
421.25	20,250	429.20	91,800
421.40	21,600	429.35	93,150
421.55	22,950	429.50	94,500
421.70	24,300	429.65	95,850
421.85	25,650	429.80	97,200
422.00	27,000	429.95	98,550
422.15	28,350	430.10	99,900
422.30	29,700	430.25	101,250
422.45	31,050	430.40	102,600
422.60	32,400	430.55	103,950
422.75	33,750	430.70	105,300
422.90	35,100	430.85	106,650
423.05	36,450	431.00	108,000
423.20	37,800	431.15	109,350
423.35	39,150	431.30	110,700
423.50	40,500	431.45	112,050
423.65	41,850	431.60	113,400
423.80	43,200	431.75	114,750
423.95	44,550	431.90	116,100
424.10	45,900	432.05	117,450
424.25	47,250	432.20	118,800
424.40	48,600	432.35	120,150
424.55	49,950	432.50	121,500
424.70	51,300	432.65	122,850
424.85	52,650	432.80	124,200
425.00	54,000	432.95	125,550
425.15	55,350	433.10	126,900
425.30	56,700	433.25	128,250
425.45	58,050	433.40	129,600
425.60	59,400	433.55	130,950
425.75	60,750	433.70	132,300
425.90	62,100	433.85	133,650
426.05	63,450	434.00	135,000
426.20	64,800		
426.35	66,150		
426.50	67,500		
426.65	68,850		
426.80	70,200		



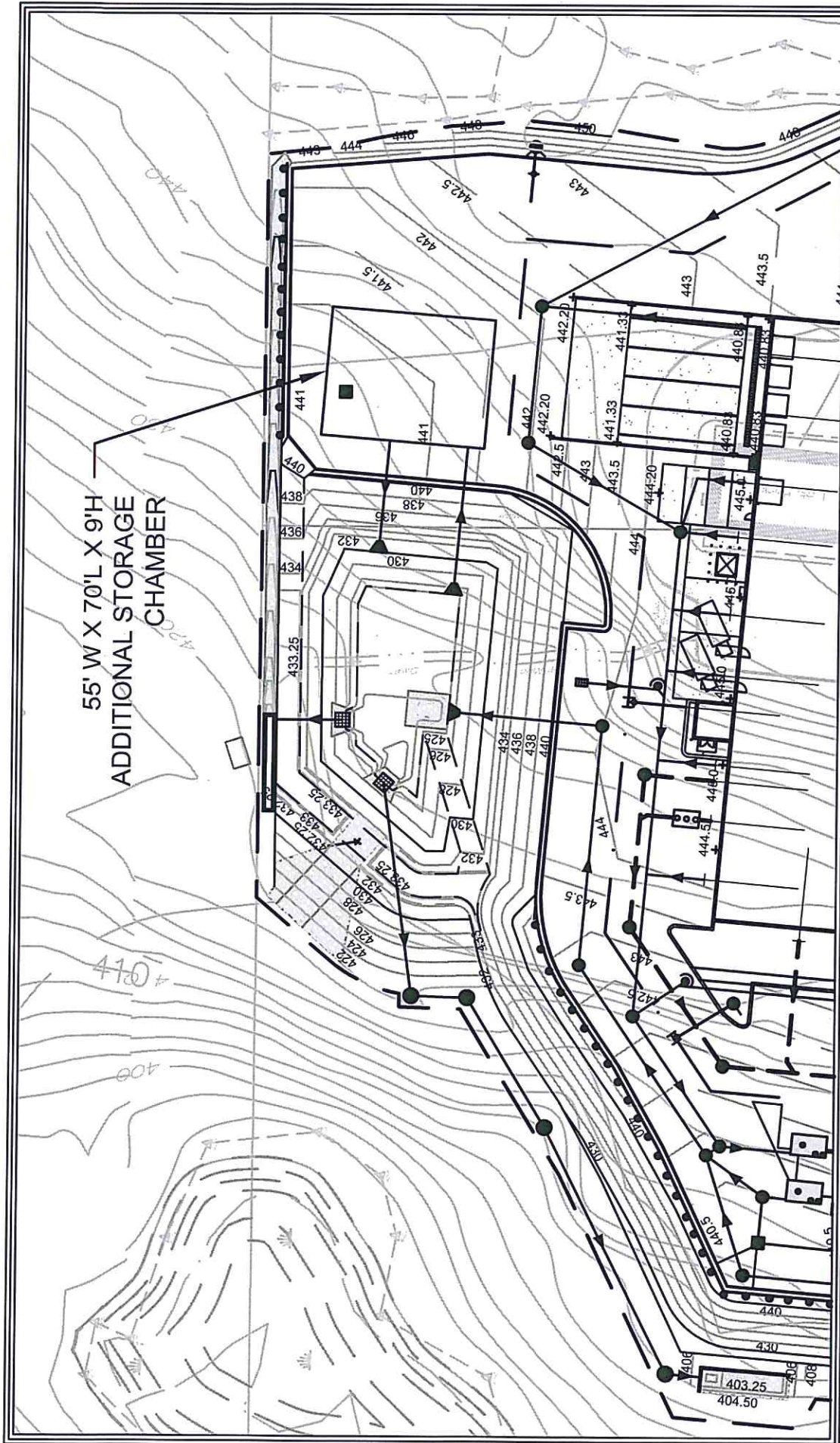


Figure 1

# Additional Flood Storage for NRCC 50 & 100 Year Post Development Storms Scale: 1"=60'



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